Big Knife Provincial Park
Biophysical Inventory

December, 1999

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SUMMARY

Big Knife Provincial Park project area covers roughly 297.54 hectares* (735.21 acres) of terrain in and along the Battle River valley southwest of Forestburg in east central Alberta. The Park represents a variety of landscapes and includes the valley bottom and slopes associated with the Battle River and the lower reach of Big Knife Creek to the north, and the northern edge of of a broad upland to the south. The Park also exhibits a variety of plant communities. Better drained sites are vegetated with a mosaic of plant communities consisting of open grasslands, shrublands and dense wooded areas while poorly to very poorly drained sites mostly in the valley bottom are suited to sedge meadows, willow dominant wetlands and cattail marshes. Extensive erosion into the valley slopes has exposed the soft Upper Cretaceous sedimentary bedrock resulting in badland features in the southern portion of the Park.

This report elaborates further on the biophysical resources of Big Knife Provincial Park based on literature reviews and a field inventory undertaken in the Park during July and October of 1998.

*** Note: For the purposes of this inventory the northern boundary was extended to the south shore of the Battle River, and includes terrain along the River below the 2194 contour line which was excluded from the Park in the official Order in Council document. This explains larger 297.54 hectares used in this inventory compared to the 295.07 hectares indicated in the official Order in Council designation for the Park.**

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1. INTRODUCTION

Big Knife Provincial Park was formally established in 1962 on the strength of its natural diversity, scenic beauty and recreational potential in east central Alberta. The Park represents an area of relatively undisturbed, naturally vegetated morainal upland, valley slopes and valley bottom terrain adjacent to the Battle River and the lower reach of Big Knife Creek. The Park lies within in the southern limits of the Central Parkland Subregion of the Parkland Natural Region. The Park displays a wide variety of physiognomic vegetation types consisting of open grasslands, shrublands, deciduous, mixedwood and coniferous forest communities, and various wetland types. This mosaic of vegetation types is a result of variable local site conditions influenced by factors such as slope, drainage and parent material. Other natural attractions in the Park include steep exposures of Cretaceous sedimentary bedrock creating local badlands topography.

Big Knife Provincial Park represents one of the few remaining relatively undisturbed remnants of the Battle River Valley and morainal uplands in east central Alberta.

2. PROJECT OBJECTIVES

Environmental Service, Parkland Region, Red Deer in cooperation with the Resource Data Division, Land and Forest Service, Edmonton were asked in 1998 to conduct a detailed inventory of the biophysical resources (terrain and soils, vegetation and fauna) of Big Knife Provincial Park by the Operations Section, Natural Resources Service located in Rimbey, Alberta. In order to fulfill this objective, it was necessary to:

- Compile all existing information into one extensive data set;
- Conduct field investigations to verify, refine and add to existing resource information;
- Standardize the data descriptions in accordance with the classification developed for protected areas management (Achuff, 1994; Alberta Environmental Protection, 1994).

3. PARK BACKGROUND INFORMATION

3.1 Location and Park Boundary

The entrance to Big Knife Provincial Park is located west of Secondary Highway 855 approximately 40 km northeast of Stettler and 13 km southwest of Forestburg in east-central Alberta. The Park is officially 295.07 hectares in area by Order in Council 292/86. and covers the north half of Section 34, portions of Sections 35 and 36 in Township 40, Range 16, West of the 4th Meridian, and portions of Sections 2 and 3 in Township 41, Range 16, West of the 4th Meridian (refer to Figure 1). The Park's northern boundary corresponds to the 2194 foot (~690 masl) contour line which represents the maximum water level elevation of the Alberta Power Forestburg reservoir impounded behind a dam located approximately 5.8 km (3.6 mi) southeast of the Park. For the purposes of this inventory the

northern boundary displayed on maps in the report is extended to correspond to the south shore of the Battle River as displayed on the orthophoto mosaic (see Maps 1, 2, 3 or 4) created from air photos flown in May of 1998. The result is a total area of 297.54 ha which is larger than the Order in Council area of 295.07 ha. The shoreline visible on the orthophoto mosaic was used for the northern boundary to eliminate problems associated with replicating the Order in Council area and to avoid the loss of biophysical information.

3.2 Park History and Land Use

The Battle River valley in Central Alberta, including the area currently occupied by Big Knife Provincial Park was an important landscape feature to the aboriginal people prior to European settlement (Finlay and Finlay, 1987). The Battle River was an important source of fresh water. The valley was used as a travel corridor throughout the year, and the mature coniferous and mixedwood forests along Big Knife Creek provided shelter from the elements. The lower portion of the Battle River was considered part of the territory of the Blackfoot Confederacy of tribes which consisted of the Bloods, Blackfoot and Piegans, occasional Crees and Assiniboines, and the Gros Ventres tribe (MacGregor, 1976). The Park is named after Big Knife Creek, which was named in recognition of a famous fight to the death near the Creek between Big Man of the Cree tribe and Knife, a member of the Blackfoot. The first European to explore the Battle River valley and a large portion of central Alberta was Anthony Henday. Henday in search of bison crossed the river near the mouth of Big Knife Creek on or about October 3, 1754 (Fedirchuk et al, 1982). Henday was instrumental in establishing fur trade in the area, which became an important economic activity in the valley during the 1800's. The Palliser expedition also travelled through the area in 1858. Palliser in his journal noted the badland formations and coal seam exposures while camping along Big Knife Creek.

The first homestead was established in the eastern portion of the Park in the river valley by Jack Coustain in 1902 (Fedirchuk et al, 1982). Here Coustain built a log cabin and barn. A steady influx of settlers followed and established homesteads in the vicinity. The Coustain family abandoned their homestead in 1906 and it remained unoccupied until 1910 when two brothers by the name of Ernest and Albert Guller from Switzerland took over the property. The Guller's gave up the homestead in 1914. In 1920, Alfred Patterson and Theo Thage occupied the land for a brief period. Jack Nelson, a local character, took over the property in 1926. Nelson farmed the river flats south of where the current campground is located and earned a reputation as an operator of a commercial still, which he ran until the early 1930's. Nelson built a new cabin and root cellar in 1927. Nothing remains of the Nelson farmstead today. The location of the still remained concealed from the authorities until it was discovered by a Park Ranger in 1965 in the bank of Big Knife Creek near its confluence with the Battle River. The still was later destroyed by the RCMP.

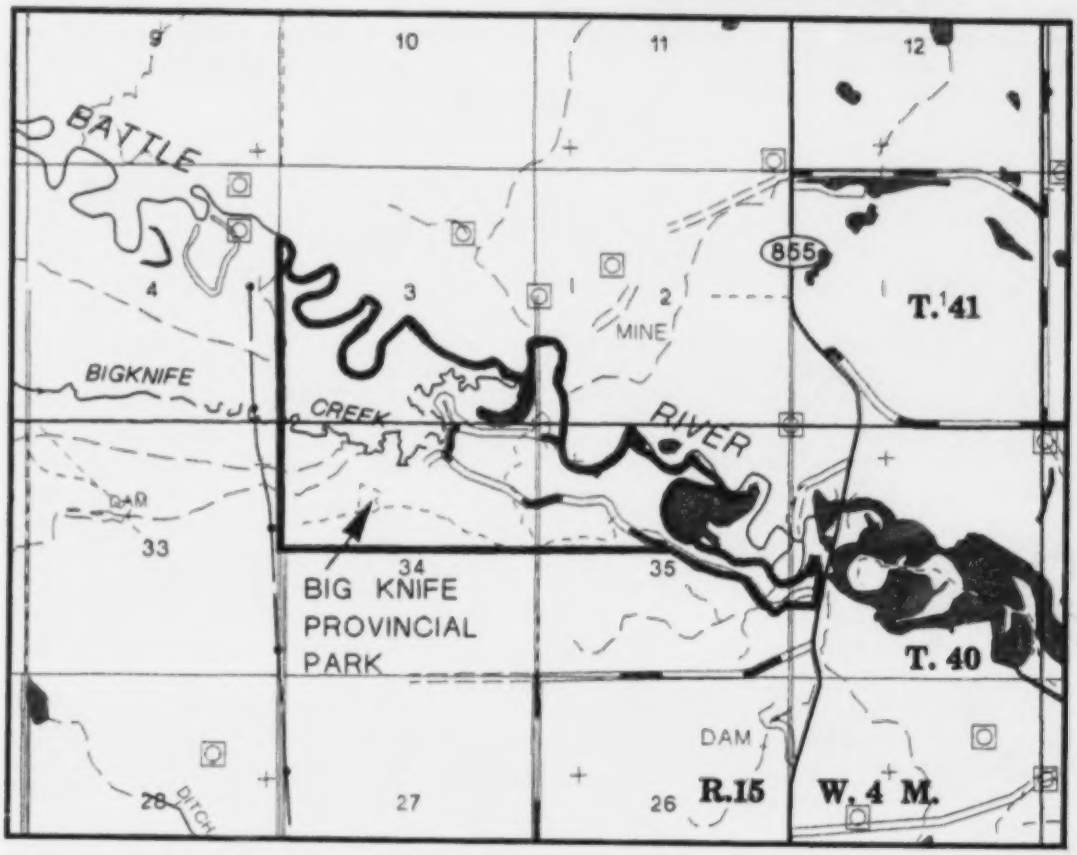


Figure 1. Location of Big Knife Provincial Park project area

In the 1950's, a sawmill operated nearby. It drew timber from the mature forests growing in the Park and adjacent areas of the Battle River valley. Evidence of past logging can be seen in the numerous old stumps in the Park and vicinity.

As early as 1956, numerous local individuals and groups recognized the potential of this area for a Provincial Park. C.H. Harvie, parks inspector with the Alberta Department of Lands and Forests, was the first government official to formally recommend that a park be established in the portion of the Battle River valley west of Highway 855. The reasons Harvie cited were the ample size of Nelson's Flats (N.E. quarter of Section 34, Township 40, Range 16, West of the 4th Meridian) for a recreation area, and the fine grove of spruce trees along Big Knife Creek near its confluence with the Battle River. Individual residents and the local Chamber of Commerce from the nearby town of Forestburg also saw the potential of this relatively undisturbed portion of the Battle River, and made this known to Department of Lands and Forests through numerous letters in the late 1950's. During this period the land was either privately owned or was Crown land leased by Canadian Utilities who operated a thermal electric generating station downstream. Cattle grazing was the authorized land use in the valley. Local residents used this area for primitive camping and outdoor recreation, and enjoyed boating and fishing on the Battle River upstream of the Forestburg reservoir. Finally after numerous requests from Jack Hillman, the local M.L.A. and local residents, the provincial government formally established Big Knife Provincial Park through an Order in Council on October 2nd, 1962. Initially the Park consisted of all its current land holdings except the N.W. quarter of Section 34, Township 40, Range 16, West of the 4th Meridian. This parcel of land was later added after officially transferring ownership from the original owner, Mr. L.K. Berry to the Crown on November 24, 1965.

Some notable events, which occurred during the early years of the Park's existence was the discovery of Nelson's commercial scale moonshine still (referred to earlier in this section). In the fall of 1965, approval was given to extract around 400 yards of gravel from southern portion of the N.E. quarter of Section 34, Township 40, Range 16, West of the 4th Meridian. In the spring of 1970, extensive flooding on Big Knife Creek caused extensive erosion and submerged the nearby campground and picnic areas. A pre-cast concrete bridge across Big Knife Creek in the same N.E. quarter of Section 34, and a concrete wading pool near the Creek were constructed in the early 1970's.

3.3 Climate

Big Knife Provincial Park occurs within the southern limits of the Parkland Natural Region close to the northern edge of the Grassland Natural Region. As as a result this area experiences climatic conditions similar to the Grassland Natural Region, namely warm, dry summers and mild winters. Climate data for the Park area is extrapolated from normals for the closest Environment Canada climate station located at the Forestburg Plant Site. The climate station is approximately 6 km south-east of the Park entrance. The normals or averages have been calculated over a 24 year period from 1967 to 1990. Due to its close proximity and its location in the Battle River valley, the station likely experiences very similar climatic conditions (Table 1) to the Park. The mean annual daily temperature is 4.0°C with the coldest mean daily temperatures of -11.6°C occurring during the month of January, and

the warmest mean daily temperature of 17.9°C occurring during July. The total mean precipitation per year is 400.3 mm. Over 50% of the total mean annual precipitation falls as rain during the summer months from June to August (212 mm out of 400.3 mm).

A second climate station is located nearby at Alliance approximately 27 km east-south-east of the Park's east entrance. Alliance occurs on a broad upland and is 716 meters above sea level. A comparison between this station and the one near the Forestburg Plant reveals slightly warmer average monthly temperatures in the Battle River valley (Table 2) throughout the whole year with the most noticeable differences from late fall to spring. These warmer temperatures likely occur at Big Knife Provincial Park as well, and are are probably the result of the ameliorating affects of the warmer often unfrozen Battle River waters impounded behind the Forestburg thermal electric plant dam located upstream of the Park.

3.4 Topography and Drainage

The Park's terrain includes:

- the northern limits of a level to gently undulating upland along the Park's southern edge,
- a broad north facing valley slope,
- and the valley bottoms of the Battle River, the lower portion of Big Knife Creek and an unnamed intermittent stream.

Terrain elevations range from a maximum of 724 masl (meters above sea level) on the southern upland to roughly 670 masl along the Battle River. Average relief from the upland to the valley bottom is about 54 meters. All drainage waters in the Park flow northward toward the Battle River, which in turn flows eastward into the North Saskatchewan drainage system. A dam downstream was built to provide cooling water for the thermal electric plant currently operated by Alberta Power. The dam has resulted in the ponding of water in the Battle River upstream and reductions in stream flow. The Reservoir extends a few hundred meters upstream past the Highway 855 bridge. Two springs located two thirds of the way up the north-facing valley slope drain northward along local channels into ponds at the base of the slope.

Table 1

Climate Data Summary for the Climate Station nearest Big Knife Provincial Park: The Forestburg Plant Site (Normals for the period 1967 to 1990)

52°28'N 112°08'W 663 meters above sea level

	Temperature (°C)					Precipitation			
Time Period	Mean Daily	Mean Max.	Mean Min.	Extreme Max.	Extreme Min.	Rain (mm)	Snow (cm)	Total (mm)	Days*
January	-11.6	-6.6	-16.7	10.5	-44.4	0.4	16.1	16.5	8
February	-9.1	-4.0	-14.3	14.5	-42.2	1.0	11.6	12.5	7
March	-2.9	1.8	-8.1	20.6	-39.4	1.7	14.3	16.1	6
April	5.5	11.1	-0.1	30.0	-25.6	9.8	7.2	17.0	5
May	11.8	17.9	5.6	35.0	-6.1	40.6	0.3	40.8	9
June	15.9	21.8	10.0	34.4	-3.3	77.4	0.0	77.4	12
July	17.9	23.6	12.1	36.0	4.4	78.3	0.0	78.3	13
August	17.0	23.1	10.7	35.6	1.1	56.3	0.0	56.3	11
September	11.5	17.3	5.8	35.6	-6.5	40.9	0.2	41.1	9
October	5.9	11.6	0.3	29.5	-19.5	12.8	2.5	15.2	5
November	-3.5	1.1	-8.2	20.5	-31.5	1.8	10.5	12.3	6
December	-10.3	-5.4	-15.3	13.0	-45.0	0.0	16.6	16.7	7
Yearly	4.0	9.4	-1.5			321.0	79.2	400.3	97

* average number of days per month and year with precipitation

Source: Environment Canada. 1993. **Canadian Climate Normals, 1961-1990, Prairie Provinces.**

Table 2

A Comparison of Mean Monthly Temperatures between the Forestburg Plant Site (Battle River valley bottom) and Alliance (upland site) Climate Stations

Month	Mean Daily Temperatures (°C)	
	Forestburg Plant Site	Alliance
January	-11.6	-16.3
February	-9.1	N*
March	-2.9	N*
April	5.5	3.7
May	11.8	10.7
June	15.9	15.0
July	17.9	17.0
August	17.0	16.3
September	11.5	11.0
October	5.9	5.5
November	-3.5	-4.2
December	-10.3	-11.9

*N - No data recorded

Source: Environment Canada. 1993. **Canadian Climate Normals, 1961-1990, Prairie Provinces**

3.5 Bedrock Geology

The Park is underlain by soft Upper Cretaceous sedimentary bedrock (Hamilton et al, 1999). Two formations, the Horseshoe Canyon and Bearpaw are evident in the steep eroded local badlands in the southern portion of the Park. Plate 1 shows an exposure of nonmarine Horseshoe Canyon formation at the surface and the older marine Bearpaw formation below.

The Horseshoe Canyon Formation consists of grey clay rich sandstones and mudstones, carbonaceous shales, concretionary ironstone beds, intermittent coal seams and variable thicknesses of clayey mudstone rich in silica. The Horseshoe Formation is the source of most of the known coal deposits in the central Alberta (Schutze et al, 1986). East and south of the Park, sub-bituminous coal from the Horseshoe Canyon Formation is currently being strip-mined to the fire the Alberta Power Forestburg thermal electric power plant.

The Bearpaw formation was laid down in an ancient marine environment during the Upper Cretaceous. It is comprised of dark grey silty shales, and greenish glauconitic and grey clay rich sandstones with thin concretionary iron and bentonitic layers. The Bearpaw Formation is the source of salinity in alluvial fans and aprons deposited at the base of eroded bedrock slopes in the Park.

3.6 Surficial Geology

The surficial geology of the Park is the result of glacial and post-glacial geomorphic processes that took place starting at the end of the Pleistocene epoch (approximately 10,000 years ago) during the Quaternary geologic period. The upland and butte remnants of this upland (between the Big Knife Creek floodplain and the Battle River valley bottom) in the southern part of the Park are overlain by deposits of medium textured till and thin veneers of coarse textured glaciofluvial sediments over till. Medium textured tills also cover the broad valley slopes, which appear to include old rotational slumps now stabilized by forest cover. Actively eroding bedrock slopes, mainly south-facing, are evident along the butte remnants.

Coarse to medium textured deposits overlie the fluvial floodplains and terraces of the Battle River, and the floodplain Big Knife Creek. Fine to coarse textured fluvial apron deposits overlie Battle River terraces at the base of actively eroding bedrock slopes. Remnant stream channels once part of the Battle River are evident in the valley bottom and contain fine textured, local lacustrine deposits laid down in small ponds or old oxbow lakes.

3.7 Soils

Soil descriptions that follow are based on Greenlee (1983), Wells and Nikiforuk (1988), and air photo intepretation and 1998 field investigations as part of this biophysical inventory.

Big Knife Provincial Park occurs within the Black Chernozemic soil zone of east Central Alberta. Orthic Black Chernozems occur on well drained till and glaciofluvial veneers over till located on the upland and butte remnants in the southern portion of the Park, and on fluvial terraces along the Battle River. A soil survey for the County of Paintearth (Wells and Nikiforuk, 1988) which includes the Park, classifies well drained Orthic Black Chernozems developed on medium textured upland till as the Elnora series while well drained Orthic Black Chernozems on coarser glaciofluvial veneers over till are referred to as the Rosebank series.. Chernozems developed on fluvial terrace deposits are included as part of Wells and Nikiforuk's (1988) Alluvium landscape class.

The broad north facing Battle River valley slope consists of old rotational slumps overlain with medium textured morainal deposits. The dominant soils on these slopes are Orthic Eutric Brunisols, which are less well developed than the Black Chernozems on the upland and valley bottom. Wells and Nikiforuk (1988) classify soils on valley slopes as belonging to the Rough Broken series.

Fluvial aprons at the base of these valley slopes are composed of deposits high in salinity. Depending on how recent deposition occurred and the amount of time for soil development, soils on these aprons can range from saline phase Orthic to Cumulic Regosols on the most recent materials to well developed Black Solodized Solonetz's on older and more stable deposits. Wells and Nikiforuk (1988) classified soils developed on fluvial aprons as the Bigknife series.

Poorly drained lacustrine sediments occur in remnant stream channels or old oxbow lakes. Soils developed on these sediments are predominantly Rego Gleysols. Rego Gleysols are also found developed on low-lying, very poorly drained recent fluvial deposits laid down by the Battle River.

In the Big Knife Creek valley, Orthic Eutric Brunisols are found on well to rapidly drained medium to coarse textured deposits on higher terraces. The lower level floodplain along Big Knife Creek is overlain with more recent coarse textured fluvial sediments and the dominant soils range from Rego Gleysols in very poorly drained sites to Cumulic and Orthic Regosols in well to rapidly drained sites. These alluvial soils are included as part of Wells' and Nikiforuk's (1988) Alluvium landscape class.

Detailed descriptions of the diagnostic features of the aformentioned soil subgroups are provided in the Canadian System of Soil Classification (Soil Classification Working Group, 1998).

3.8 Vegetation Patterns

Vegetation in the Park reflects the regional climatic conditions as well as local factors such as aspect, slope, terrain surface stability and moisture availability. The uplands are vegetated with a variety of physiognomic vegetation types consisting of woodlands, shrublands and open grasslands. The north-facing valley slopes are completely vegetated with deciduous and mixedwood tree cover while southern slopes reveal more open grasslands, shrublands and unvegetated exposed sedimentary bedrock. The fluvial

terraces consist of open grasslands, shrublands, and scattered woodlands. The moister site conditions of the Big Knife Creek floodplain is well suited to the growth dense coniferous and mixedwood forest cover with occasional wet shrublands. Wet sedge meadows and shallow marshes are restricted to dry oxbow lakes, and cattail marshes occur along the edge of the Battle River channel.

3.9 Fauna

The Park and adjacent Battle River and Big Knife Creek valleys contain a wide variety of habitats suited to numerous species of fauna which frequently use these uplands, slopes and bottomlands not only for food and shelter but also as travel corridors. Details on the specific species present in the Park and their habitat preferences are presented in Section 8.0 and 9.0.

4. INVENTORY METHODS

4.1 Field Investigations

Seventy sites were sampled in the Park area from July 20 to 24, 1998, and September 30 and October 1, 1998. Refer to Map 1 enclosed in the back for site locations. Sites were selected to recognize the variability evident in the landscape and the need to represent common and unique features. The majority of sample sites were selected prior to fieldwork from 1:5000 scale aerial photography flown in the spring of 1998. Additional sites were selected in areas of interest that became apparent during the course of field investigations. Site, soils and vegetation data were collected on custom field forms and according to procedures outlined in the Ecological Land Survey Site Description Manual (Alberta Environmental Protection, 1994b).

Vegetation at a number of field sites was often examined over a larger area than the 10 by 10 m^2 plot recommended in the Ecological Land Survey Description Manual. This was necessary to account for plant species variation or patchiness, which often occurs over areas larger than 10 by 10 m^2 within a single vegetation community. Plants were identified to species where possible. Moss (1983) was the primary taxonomic reference for all plant vascular species except for *Festuca* whose taxonomy has undergone recent changes (Aiken and Darbyshire, 1990). All species names correspond to the Alberta Plants and Fungi - Master Species List and Species Group Checklists (Alberta Environmental Protection, 1993). The species identified at field sites and presented in this report and in Appendix 3 are by no means an exhaustive listing of all vascular and non-vascular plants growing in the Park.

Complete lists of plant species were recorded for most of the sites observed in 1998. For a number of sites, only the dominant plants species were recorded in order to investigate as many sites as possible in the limited time available. This information, along with the site description and soils attributes, provides the basis for the vegetation classification in this report.

4.2 Classification and Mapping

Classification of the Park's landscape was conducted in accordance with the natural history levels and associated themes classification system developed by Achuff (1994). Level 1 Natural History Theme identifies broad, easily mapped landscape units. Existing Level 1 themes and codes were used to identify each unit where possible. These existing themes were modified to provide more detailed landscape descriptions by creating Level 1 subclasses. Level 2 vegetation types were based on the physiognomic structure of the vegetation (particularly in the uplands) and site moisture conditions (more of a factor in wetlands). Both landforms and vegetation types were classified on 1:5,000 scale air photos flown in April of 1998. The classes and polygons were then digitized creating a spatial database from which Level 1 Landscape Types (Map 2 enclosed in the back) and Level 2 Vegetation Types (Map 3 also in the back) maps were generated at a scale of 1:5,000 on an orthophoto background.

It should be noted that some vegetation types, especially the low shrublands, mixed woodlands and wetlands, were difficult to stratify on the photos. This is likely the result of the time of year the photography was flown. Shrub and tree leaves were not out yet, making it difficult to gauge height and to determine deciduous tree and shrub species from the photographs especially where low shrubs occur in association with grasslands. Due to these difficulties, the Level 2 grassland vegetation type may include low shrublands, particularly patches of very short buckbrush (*Symphoricarpos occidentalis).* In many mixedwood stands the deciduous tree component often forms a larger portion of the understory tree canopy which makes it difficult to identify tree species especially when leaves are not present. Deep marsh and wet meadow classes were difficult to separate since they looked very similar in tone and texture on the air photos. An attempt has been made to separate these wetlands based on topographic location evident on the photographs. Where this was not possible these types were treated as a complex.

It should be noted that no field classification guide similar to those developed for the green area in northern and western Alberta (Beckingham and Archibald, 1996; Archibald et al., 1996; Beckingham et al., 1996) currently exists to define Parkland ecosites and vegetation communities. Vegetation communities in this report have been classified with an attempt to identify community classes similar to those presented in other Parkland region studies (Fehr 1984; Fehr 1982; Peters and Ovenden 1974; Smith and Kondla 1972). Many of these studies view the aspen woodlands as a single community. In this report, the aspen woodlands have been subdivided into communities according to their dominant understory vegetation, topographic position and site characteristics. The Field Guide to Ecosites of West-central Alberta (Beckingham et al., 1996) was used as a framework to classify wooded vegetation communities possessing a boreal element such as the white spruce stands growing in the Big Knife Creek floodplain.

Level 3 vegetation community descriptions were included to provide further information on vegetation and site factors. In most instances the vegetation communities have been classified based on site characteristics, topographic position and the dominant species present. This Natural History Theme level is not easily mapped, however, it provides additional information regarding the subtle influences of local site factors in the landscape.

The Level 3 vegetation community name identifies the dominant vegetation species present in each stratum. Dashes distinguish co-dominant plant species present in the same stratum. Forward slashes differentiate physiognomic strata, and parentheses recognize species, which occur occasionally particulary in the tree canopy layer. 1998 field sample sites representing vegetation communities are listed in the descriptions. Superscript numbers identify the numbers of sites possessing a specific site characteristic (e.g. slope class, aspect, parent material, soil drainage, nutrient regime, and corresponding Level 1 classes). There is no superscript number if the particular site condition applies only to one site. Common plant species associated with each plant community are listed at the end of each section. This is by no means an exhaustive list, however, it does indicate the dominant species observed within that particular community in 1998. For definitions of the site and soils characteristics, refer to Appendix 1 in the back of this report. Complete definitions of site and soil characteristics are available in the following references: Ecological Land Survey Site Description Manual (Alberta Environmental Protection, 1994b), The Canadian System of Soil Classification (Soil Classification Working Group, 1998), and the Physical Land Classification Methodology (Kocaoglu, 1990).

4.3 Disturbances

A number of disturbed sites were observed in the Park. Dense patches of non-native smooth brome (*Bromus inermis*) were noted at several sites mainly in the uplands and upper valleys slopes, and to a lesser extent on the valley floor. This grass species has invaded the grasslands, shrublands and the fringes of woodlands in the southern upland, and has become the dominant species in the grass and forb strata in a large number of vegetation communities. It is not clear whether this brome was seeded or has moved in from adjacent farm fields. Smooth brome is invading aspen woodlands on the upper valley slopes and is causing a reduction in the diversity and cover of native understory grasses and forbs. At one site on the uplands (Site 8), smooth brome has encroached 16 meters north from a hiking trail into an Aspen / Chokecherry - Saskatoon community located on the upper portion of the north facing Battle River valley slope. At another site (Site 17), smooth brome has invaded 40 meters from a hiking trail through a band of Aspen / Buckbrush - Red Raspberry community into a stand of Aspen / Chokecherry - Saskatoon. Smooth brome invasion is also evident along the paved road entering the Park, and occurs in patches on the Battle River fluvial terrace in the northwest corner of the Park.

Other signs of local disturbances observed in the field in 1998, were remnants of an old shallow gravel pit revegetated with smooth brome in the southern portion of the N.E. quarter of Section 34, Township 40, Range 16, West of the 4th Meridian. Disturbances associated with campground development, parking lots, administrative buildings, picnic and recreation areas and road access are evident in the eastern half of the Park. Mowed trails, no more than a few meters in width and narrower trails cut into the mineral soil by hikers criss-cross each other in the southern and western portions of the Park. Old tree stumps in the white spruce stands in the valley bottom remain as evidence of past logging activity.

5. LANDSCAPE TYPES (LEVEL 1)

Level 1 landscape features in the Park can be listed under four general categories based on terrain elevation, slope and surface configuration and disturbance factors. These are:

- Uplands - Northern limits of a level to undulating upland and butte remnants of this upland in the southern part of the Park.
- Valley Slopes - all valley slopes both vegetated and non-vegetated and facing primarily north and south.
- Valley Bottom along the Battle River, and Big Knife Creek and its unnamed tributary.
- Disturbed Areas located throughout the uplands and valley bottoms.

Map 2 inserted in the back of this report provides the Level 1 Landscape Type classification for the Park.

5.1 Uplands

Three Level 1 classes have been mapped on the Uplands. Ss1 represents a broad area of sandy upland consisting of level to undulating (0 to 7% slope) coarse glaciofluvial veneers over medium textured continental till or moraine. Ng1 and Ng2 have no sandy glaciofluvial overlays and consist of medium textured tills at the surface. Ng1 occurs at the same elevation and has the same level to undulating (0 to 5% slopes) topography as Ss1. Ng1 also represents the till covered surfaces of three small buttes in the eastern portion of the Park which were once a part of the broader upland. Ng2 is a remnant of the broader upland, which slumped to a lower level many years ago. Most of Ng2 has a level to undulating terrain surface (2 to 5%) expression with short steeper slopes (up to 25%) representing old slump scars. Till parent material is thinner in areas of Ng2 and occasionally bedrock is evident at the surface. Dominant soils in Ss1 and Ng1 are rapidly to moderately well drained Orthic Black Chernozems. Orthic Black Chernozems on till and glaviofluvial veneers over till are respectively categorized as the Elnora series and Rosebank series (Wells and Nikiforuk, 1988). Ng2 units consist predominantly of well to moderately well drained Solonetzic Black Chernozems and Black Solodized Solonetz's in areas where saline bedrock occurs at or near the surface.

5.2 Valley Slopes

Valley slopes include those protected by continuous vegetation cover and exposed bedrock surfaces. Vp1 classifies wooded, predominantly north-facing valley slopes (10 to 60%) overlain by medium textured till and occasional coarse glaciofluvial veneers over till. These slopes exhibit old rotational slumps, which are now stabilized by continuous tree cover. Soils underlying these slopes are primarily rapidly to moderately well drained Orthic Eutric Brunisols.

Vp2 slopes are primarily south-facing and are overlain by the same till and occasional glaciofluvial veneers. The southern aspect makes these slopes drier and as a result they are vegetated predominantly by open grasslands. They are also steeper (25 to

70%) than Vp1 slopes. The dominant soils on these drier slopes are rapidly to very rapidly drained Orthic Regosols and the occasional Orthic Eutric Brunisols.

Fluvial aprons (Vp3) are often found at the base of both protected and exposed slopes. The slopes range from 5 to 18%. Sporadic deposition of saline sediments from upper slopes occurs on a number of these aprons. This results in soils, which range from poorly developed, moderately well drained Orthic Regosols (saline phase) to better developed, well drained Solonetzic Black Chernozems.

Vp4 represents steep slopes (45 to 75%) of a V-shaped intermittent stream channel in the south-eastern portion of the Park. Low shrubs grow on Vp4 slopes and the predominant soils are well to rapidly drained Orthic Regosols and Eutric Brunisols.

Two springs (Vs) occur on the broad north-facing Battle River valley slope. Greenlee (1983) identified the location of these springs in a soil survey of the Park. Only one was investigated in 1998. This unit includes the source of the spring and the discharge zone at the base. Slopes in this unit range from 10 to 20%. Soils are predominantly poorly drained Rego Gleysols.

Vx represents steep, unvegetated exposures of Upper Cretaceous Horseshoe Canyon and Bearpaw sedimentary bedrock. Vx slopes are very steep and often exceed 100%. There is no soil development on these slopes except for the occasional rapidly drained Orthic Eutric Brunisols and Orthic Regosols on colluvial veneers, which drape over the top portions of these slopes.

5.3 Valley Bottom

Valley bottom Level 1 units represent floodplains, fluvial terraces and remnant oxbow lakes and river channels. Vf1 and Vf2 occur in the floodplain of Big Knife Creek. Vf1 represents the narrow stream channel of the Creek along with an intermittent tributary channel joining up with the Creek in the western section of the Park. The channel of Big Knife Creek is quite narrow. Creek flow is currently impeded by numerous beaver dams. Most of this unit is open water with occasional coarse floodplain deposits in bars located along the channel. Soils range from poorly drained Rego Gleysols to well and rapdily drained Cumulic Regosols and Orthic Eutric Brunisols. Vf2 is the broad floodplain of Big Knife Creek (2 to 5% slopes) located outside of the Vf1 channels. Vf2 floodplain parent materials range in texture from medium to coarse. Vf2 soils range from well to rapidly drained Orthic Eutric Brunisols, and Cumulic and Orthic Regosols under dense coniferous and mixedwood stands to occasional very poorly drained Orthic Humic Gleysols under wet tall shrublands.

Vf3, Vf4, Vf6, Vf7 and WlWm units occur on the Battle River fluvial terraces, and Vf5, Wd and WdVf5 are located in the Battle River floodplain. Vf3 represents fluvial terraces (0 to 10% slope) overlain with medium textured alluvium. The underlying soils are well to moderately well drained Orthic Black Chernozems. Occasional remnants of shallow stream channels are evident on the terrain surface of Vf3 units. Vf4 is a portion of the Battle River terraces overlain by thin, relatively recent accumulations (0 to 5% slope) of saline fluvial apron deposits west of the Big Knife confluence. Apron textures vary from

clays to fine sands. Dominant soils range from Orthic Regosols (saline phase) to Black Solodized Solonetz's. Both of these subgroups are part of the Big Knife soil series (Wells and Nikiforuk, 1988). Vf4 is considered part of the Battle River valley bottom rather than a Vp3 because it is more level and conforms to the general topographic configuration of the valley bottom.

Vf5 (0 to 6% slope) represents a portion of the Battle River floodplain located between the higher Vf3 fluvial terraces and lower Wd and WdVf5 wetlands. Vf5 is distinguished from the lower level Wd (Deep Marsh) and WdVf5 (Deep Marsh / Wet Meadow Complex) landscape types by having a higher terrain elevation and slightly better drainage (poorly to imperfectly drained). The Vf5, Wd and WdVf5 units are underlain by medium to coarse textured fluvial deposits. Wd (Deep Marsh) represents areas completely submerged under water along the Battle River and vegetated with emergent cattail and sedge vegetation. WdVf5 units represent swales and point bars along the Battle River channel with large areas submerged under water vegetated by emergent cattails and sedges, and smaller areas of slightly raised ridges (similar to Vf5 units) vegetated by wet grass meadow and wet tall shrubland vegetation communities. Dominant soils of Wd and WdVf5 units are poorly to very poorly drained Rego Gleysols.

Medium to fine textured lacustrine sediments in remnant stream channels and old oxbow lakes are classed either as Vf6 or Vf7, depending on the dominant plant species present and on the amount of salinity in the parent material. Vf6 occurs in remnant channels on the Battle River fluvial terraces west of the Big Knife Creek confluence. The lacustrine sediments in Vf6 units are non-saline. Soils developed on these sediments are predominantly poorly to very poorly drained Rego Gleysols. Vf7 represents lacustrine deposits with a higher salinity in remnant channels in the eastern half of the Park. Parent materials are medium to fine-textured, and underlie very poorly drained Rego to Orthic Gleysols and saline soils such as imperfectly drained Gleyed Black Solods and Solodized Solonetz's with occasional Gleyed Black Chernozems. Terrain slopes in Vf6 and Vf7 units on average range from 0 to 2%. Around the perimeter of Vf7 units, steeper short slopes up to 15% rise to upper terraces.

WlWm designates a pond and wet meadow complex at the base of a spring in the eastern half of the Park. Deposits are fine textured lacustrine sediments. Very poorly drained non-soils to Rego Gleysols are the dominant soils in this unit.

5.4 Disturbed Areas

Level 1 Disturbance classes D1, D2, D3 and D4 occur throughout the Park. These are a result of human activity. D1 is an old shallow gravel pit in coarse glaciofluvial veneers over till near the southern boundary of the Park. D2 designates park roads, parking lots, sites around Park buildings and the campground. D3 is a shallow excavation on the fluvial terrace east of the campground. D4 is the level playing field south of the campground. This field was once cultivated. The entire D4 area is predominantly vegetated by non-native smooth brome (*Bromus inermis*). Depending on the degree of disturbance, soils can range from non-soil in severely affected areas to Orthic Black Chernozems under naturally vegetated remnants. Parent material textures in disturbed units range from coarse to

medium. Drainage can also range from imperfect to well. Section 4.3 identifies smooth brome occurrences as a disturbance feature, which affects natural vegetation communities. However, these occurrences have not been identified as specific Level 2 disturance landscape units because they are too difficult separate on current air photos from natural grasslands or from low and tall shrublands. Pure patches of smooth brome other than the extensive community found in D4 are sporadic, scattered and small in area. It was beyond the scope of this biophysical project to attempt to map out every single occurrence of smooth brome. However, numerous grassland, low shrub, tall shrub, and even some woodland communities (particulary the edges of deciduous tree stands adjacent to grasslands and shrublands in the southern upland and along the entrance road to the Park) are likely to have significant amounts of smooth brome in the understory.

6. VEGETATION TYPES (LEVEL 2)

Level 2 Natural History Themes according to the Alberta Protected Areas System Analysis Report 3 (Alberta Environmental Protection, 1994a) represent broad vegetation units and widespread geologic features. Map 3 (inserted in the back of the report) depicts Level 2 Natural History Theme Vegetation Types, which corresponds to vegetation physiognomic cover types. Level 2 vegetation types in the Park are subdivided into two categories: dry sites (non-wetlands) and wetlands. Dry sites are lands that have a higher elevation or good drainage conditions (Achuff, 1994). Dry sites in the Park include the previously discussed Uplands, Valley Slopes, Valley Bottom and Disturbed Areas. Wetlands remain saturated with water for long periods as evidenced by poorly drained soil conditions, the presence of hydrophytic vegetation and biological activity adapted to wet conditions (National Wetlands Working Group, 1988). Wetlands in the Park occur in the valley bottom.

Dry sites consist of Grasslands (G), shrublands subdivided into Low Shrublands (LS) and Tall Shrublands (TS), woodlands subdivided into Deciduous Woodlands (DW), Mixed Woodlands (MW) and Coniferous Woodlands (CW), Non-vegetated areas (NV) and Anthropogenic areas (A). Grasslands (G) are predominantly vegetated by grass species, forbs, occasional low shrubs, and lack trees.

Shrublands lack a tree overstory and possess total shrub covers equal or greater than 10%. Low Shrublands (LS) have a high density of shrubs shorter than one meter often interspersed with grasses and forbs. Typical low shrubs observed in the Park are buckbrush (*Symphoricarpos occidentalis*), rose species (*Rosa* spp.), currant species (*Ribes* spp.) and wild red raspberry (*Rubus idaeus*). Tall Shrublands (TS) differ from Low Shrublands by having a high density of shrubs with heights one meter or greater. Typical tall shrubs associated with dry sites in the Park are chokecherry (*Prunus virgiana*), pin cherry (*Prunus pensylvanica*), saskatoon (*Amelanchier alnifolia*), red-osier dogwood (*Cornus stolonifera),* beaked hazelnut (*Corylus cornuta*) and silverberry (*Elaeagnus commutata*).

Woodlands consist of trees greater than 5 meters in height and possess tree canopy crown closures of 6% or greater (Nesby, 1997). A Deciduous Woodland (DW) tree canopy consists primarily of deciduous species such as aspen (*Populus tremuloides*), balsam

poplar (*Populus balsamifera*) and white birch (*Betula papyrifera*). Deciduous Woodlands may contain coniferous trees such as white spruce (*Picea glauca*), however, total coniferous cover is less than 20% of the total tree cover. Mixed Woodlands (MW) have a blend of deciduous and coniferous tree species. Total coniferous tree cover in the canopy is greater than or equal to 20%, and less than or equal to 80% with the remainder of the canopy's species composition made up of deciduous trees (Beckingham et al, 1996). Coniferous Woodlands (CW) have canopies where greater than 80% of the trees consists of coniferous species. Deciduous trees may occur occasionally, and comprise less than 20% of the total canopy.

Non-vegetated (NV) sites are the steep, bare, predominantly south-facing exposures of sedimentary bedrock in the southern portion of the Park. The areas classed as Anthropogenic (A) include the gravelled and paved access roads, gravelled parking lots, campgrounds with gravelled pads and yards around administrative buildings in the Park. Anthropogenic sites often include remnant patches of native vegetation ranging from grasslands to woodlands, and introduced species primarily grasses.

Wetlands consist of Wet Tall Shrublands (TSW), Wet Meadows (WM), Shallow Marshes (SM) and Deep Marshes (DM). Wet Tall Shrublands are associated with poorly drained sites. These shrublands consist of tall shrubs one meter or greater in height, and include willows (*Salix* spp.) and river alder (*Alnus tenuifolia*) which generally prefer wetter site conditions.

Wet Meadows (WM) occur in areas where surface water persists temporarily for a few weeks in the spring or after a heavy rainfall. Water disappears from the site quickly through seepage or evapotranspiration (Adams, 1988). Wet meadows consist primarily of low to intermediate grasses, sedges and forbs and tend to be more floristically diverse than wetter shallow marshes (Millar, 1976). Typical Wet Meadow plant species in the Park are foxtail barley (*Hordeum jubatum*), marsh reed grass (*Calamagrostis canadensis*), redtop (*Agrostis alba*), Canada thistle (*Cirsium arvense*) and wild mint (*Mentha arvensis*).

Shallow Marshes (SM) occur in very poorly drained sites, which have 0 to 30 cm of standing water till midsummer indicating seasonal flooding (National Wetlands Working Group. 1988). Shallow Marshes often occur adjacent to Wet Meadows, in the central portion of seasonal ponds, and along the margins of permanent ponds or saline lakes. Vegetation in Shallow Marshes is comprised of coarse grasses and sedges intermixed with hydrophytic herbs and occasional floating vegetation species. Typical Shallow Marsh plant species evident in the Park are water sedge (*Carex atherodes*) and common tall manna grass (*Glyceria grandis*).

Deep Marshes (DM) do not dry out and usually retain at least a few centimeters of standing water. In the Park, Deep Marshes border the open water of the Battle River as well as forming islands of emergent vegetation in the middle of the river. The most common emergent plant species in the Deep Marshes located along the northern perimeter of the Park are cattail (*Typha latifolia*) and small bottle sedge (*Carex utriculata*).

7. VEGETATION COMMUNTIES (LEVEL 3)

7.1 Introduction - A Comparison of Current Level 3 Classification of the Park with Ebel et al's (1973) Vegetation Classification

Ten vegetation types consisting of 22 communities were identified during course of this study (Table 3). Six of these types representing 16 communities grow on drier, non-wetland sites where soil drainage conditions range from very rapid to imperfect. The remaining four vegetation types are classed as wetlands and are represented by six vegetation communities. Drainage is impeded and ranges from imperfect to very poor at these wetland sites. The vegetation is classified and described in greater detail in this inventory than an earlier ecological survey for the Park by Ebel et al (1973), who identified 8 plant community groupings.

All three woodland types (Deciduous Woodland, Mixed Woodland and Conferous Woodland) discussed in this report were also recognized in the Ebel et al's 1973 study. However, a diversity of understory plant species, and site and soil conditions in the aspen woodlands warranted the separation of this type into distinct plant communities in this inventory. Ebel et al (1973) recognized the diversity in shrub species present in the Park but decided to group all dry shrublands as one. In this inventory, shrublands have been classified into tall and low shrubland types based on the physiognomic structure of the shrub species present. The tall and low shrubland types were then further subdivided into communities recognizing the dominant shrub species.

Similarly, the grasslands are defined in greater detail in this inventory. Four grassland communities are classified versus Ebel et al's (1973) two grassland community groupings. In addition to the fescue grasslands and prairie or mixed grasslands, which Ebel et al (1973) identified, two additional grass communities are described in this report. These are a disturbed Smooth Brome (*Bromus inermis*) community and a Western Wheat Grass – Kentucky Blue Grass (*Agropyron smithii - Poa pratensis*) community growing on saline soils developed on active fluvial aprons at the base of eroding bedrock slopes. Fehr (1982) recognized a June Grass / Kentucky Blue Grass (*Koeleria cristata (now Koeleri micrantha) - Agropyron smithii*) in the Rumsey Ecological Reserve which possesses similar site and vegetative characterisitics to the Western Wheat Grass / Kentucky Blue Grass (*Agropyron smithii - Poa pratensis*) community identified in Big Knife Provincial Park.

Four wetland types are described in this report compared to Ebel et al's (1973) willow and aquatic types. Ebel et al's willow community grouping is equivalent to the wet tall shrubland community recognized during this study, and their aquatic habitat community grouping has been subdivided in this report into wet meadow, shallow marsh and deep marsh vegetation types.

7.2 Dry Sites (Non-Wetlands)

7.2.1 Grasslands

Grasslands in the Park occur on dry, level to gently sloping terrain associated with fluvial aprons at the base of eroded bedrock slopes, on fluvial terraces along the Battle River, and on uplands and butte remnants in the southern and western portion of the Park. Grassland species typical of the drier Prairie Natural Region in southern Alberta grow on steep south-facing slopes in the Park where growing conditions are drier and harsher, and soils are less well developed. Most of the grasslands in the Park consist predominantly of plains rough fescue (*Festuca hallii)* and Kentucky blue grass (*Poa pratense)* growing on Orthic Black Chernozemic soils developed on level to gently undulating fluvial terraces, uplands and butte remnants of those uplands. At the base of actively eroding bedrock slopes, grass growth is sparse and salt tolerant plant species such as western wheat grass (*Agropyron smithii)* and cacti are dominant. Smooth brome (*Bromus inermis*) is an invasive species and is evident in most grassland communities in the uplands, along the entrance road into the Park and in patches along hiking trails on the Battle River fluvial terrace in the northwest corner of the Park.

Smooth Brome (*Bromus inermis*)- non-native community (disturbed); Plate 2

An almost pure community of smooth brome exists on a level playing field south of the campground (D4). The very dense and even distribution of smooth brome at this location indicates that this grass species may have been sown in the recent past and probably grows on a former cultivated field. Forb cover is very minimal with prairie sagewort (*Artemisia ludoviciana*) most common. Moderately well drained Orthic Black to occasional imperfectly drained Gleyed Black Chernozemic soils overlying medium textured fluvial terrace deposits are the dominant soils in this subhygric, permesotrophic site.

Vegetation Type: grassland

Community: Smooth brome (*Bromus inermis*) – disturbed, non-native community (n=1)

Sites:	3 (disturbed)
Slope:	(0-1%)
Aspect:	level
Parent Material:	Ft
Surface Texture:	SiCL
Subsurface Texture:	SiCL
Soil Subgroup:	O.BL to GL.BL
Soil Drainage:	moderately well drained to imperfectly drained
Moisture Regime:	subhygric
Nutrient Regime:	permesotrophic
Level 1 Class:	D4

Vegetation:

Forbs:	prairie sagewort	*Artemisia ludoviciana*
Grasses:	smooth brome	*Bromus inermis*
	Kentucky blue grass	*Poa pratensis*

Sand Grass / Muhly Grass (*Calamovilfa longifolia - Muhlenbergia cuspidata*); Plate 3

This community is found on steep, mid to upper, south-facing slopes overlain by morainal veneers and blankets over bedrock (Vp2). The steep slopes and south aspect result in xeric to subxeric site conditions, which restrict soil development and vegetation growth. Site 22, located on a steep upper slope (65%) possesses sparse vegetation on very rapidly drained, poorly developed Orthic Regosolic soils. Prairie grasses make up most of the plant species in this community along with a very minor component (2 to 3% cover) of buckbrush (*Symphoricarpos occidentalis*) and a small number of forbs. Buckbrush appears to be invading upslope at Site 22. Cover and diversity of grass species was highest on the less steep middle slopes. Narrow bands of this grassland community frequently occur on morainal and colluvial veneers, which drape over the steep, upper slopes of exposed bedrock surfaces represented by Level 1 Landscape Unit Vx (Plate 3).

Vegetation Type: grassland
Community: Sand Grass – Muhly Grass (*Calamovilfa longifolia - Muhlenbergia cuspidata* (n=2)

Sites:	21, 22
Slope:	(16-30%), (46-70%)
Aspect:	S^2
Parent Material:	Mvb/R^2
Surface Texture:	SCL, SCL
Subsurface Texture:	gkSCL, CL
Soil Subgroup:	O.EB, O.R
Soil Drainage:	rapid, very rapid
Moisture Regime:	subxeric, xeric
Nutrient Regime:	submesotrophic[2]
Level 1 Class:	$Vp2^2$

Vegetation:

Forbs:	pasture sagewort	*Artemisia frigida*
	bastard toad-flax	*Comandra umbellata*
	tufted white prairie aster	*Aster ericoides*
	broomweed	*Gutierrezia sarothrae*
Grasses:	sand grass	*Calamovilfa longifolia*
	muhly grass	*Muhlenbergia cuspidata*
	blue grama grass	*Bouteloua gracilis*
	green needle grass	*Stipa viridula*
	blunt sedge	*Carex obtusata*

Plains Rough Fescue – Kentucky Blue Grass (*Festuca hallii - Poa pratensis*); Plate 4

This community occurs on very gently sloping, fluvial aprons (Vp3, Vf4), terraces (Vf3) in the valley bottom, and relatively level morainal deposits (Ng1, Ng2). Orthic Black soils predominate in the uplands, while Solonetzic soils are more common on the saline parent materials evident in the fluvial aprons and shallow fluvial channels eroded into marine Bearpaw bedrock. Site 47 was situated on thin morainal deposits over bedrock located in the southern uplands. The soil at the site was a Black Solodized Solonetz. Submesic, mesotrophic site conditions are typical in this communtiy. A dense cover of plains rough fescue (*Festuca hallii)* and Kentucky blue grass (*Poa pratensis*) are the dominant species in this community. Shrubs constitute a very minor component and are often observed invading from adjacent shrublands. A number of forbs are associated with this community, however, they are often present in trace amounts. Some of the plots included in this community appear transitional to the Kentucky Blue Grass – Western Wheat Grass (*Poa pratensis - Agropyron smithii*) community; however due to the presence of a relatively dense cover of fescue were included in the Plains Rough Fescue – Kentucky Blue Grass community.

Vegetation Type: grassland

Community: Plains Rough Fescue – Kentucky Blue Grass (*Festuca hallii - Poa pratensis*) (n=10)

Sites:	12, 15, 23A, 47, 53, 57, 59, 60, 67, 68
Slope:	(2-5%)[8], (0-1%), (6-9%)
Aspect:	S[5], E[2], N, SE, level
Parent Material:	Fa[5], M[3], Mvb/R, Ft
Surface Texture:	CL[6], SCL[2], C, SC
Subsurface Texture:	SCL[5], CL[4], S
Soil Subgroup:	BL.SS[4], O.BL[4], BL.SZ, O.R (saline phase)
Soil Drainage:	moderately well[6], well[4]
Moisture Regime:	submesic[7], subxeric[2], mesic
Nutrient Regime:	mesotrophic[8], submesotrophic, hypereutrophic
Level 1 Class:	Vp3[4], Ng1[3], Ng2, Vf3, Vf4

Vegetation:

Forbs:	tufted white prairie aster	*Aster ericoides*
	prairie sagewort	*Artemisia ludoviciana*
	wild bergamot	*Monarda fistulosa*
	Canada thistle	*Cirsium arvense*
	common yarrow	*Achillea millefolium*
	pasture sagewort	*Artemesia frigida*
	low goldenrod	*Solidago missouriensis*
	northern bedstraw	*Galium boreale*
	three-flowered avens	*Geum triflorum*

Grasses:	plains rough fescue	*Festuca hallii*
	Kentucky blue grass	*Poa pratensis*
	june grass	*Koeleria macrantha*
	smooth brome	*Bromus inermis* (plots 15, 47)

Kentucky Blue Grass – Western Wheat Grass (*Poa pratensis - Agropyron smithii*); Plate 5

The Kentucky Blue Grass – Western Wheat Grass community (Plate 5) is generally associated with gently sloping active fluvial fans and aprons at the base of steep, exposed bedrock slopes (Vp3, Vf4). These fans receive an influx of fresh sediments from the bedrock slopes during periods of active water erosion and deposition. The fluvial fan and apron parent materials are high in clay content and salts, which restrict vegetative growth. Soils are predominantly moderately well drained Regosols (saline phase) or Solodized Solonetz's with hard clay pans. Vegetation cover in this community is sparser than that found in Plains Rough Fescue – Kentucky Blue Grass communities in adjacent fluvial terrace sites in the Battle River valley. Often patches of bare ground are present. Halophytic or salt tolerant species such as western wheat grass (*Agropyron smithii*), alkali blue grass (*Poa juncifolia*) and gumweed (*Grindelia squarrosa*) grow on these sites. Brittle prickly pear cactus (*Opuntia fragilis*) is also very common. Sage species (*Artemisia* spp.) are the only common forbs.

Vegetation Type: grassland (saline)

Community: Kentucky Blue Grass – Western Wheat Grass (*Poa pratensis - Agropyron smithii*) (n=5)

Sites:	31, 38, 49, 61, 69
Slope:	(0-1%)[3], (6-9%)[2]
Aspect:	NE[2], N[2], level,
Parent Material:	Fa[5]
Surface Texture:	C[5]
Subsurface Texture:	C[5]
Soil Subgroup:	BL.SS (eroded)[3], O.R (saline)[2]
Soil Drainage:	moderately well[5]
Moisture Regime:	subxeric[4], submesic
Nutrient Regime:	submesotrophic[3], mesotrophic, hypereutrophic
Level 1 Class:	Vp3[2], Vf4[3]

Vegetation:

Forbs:	pasture sagewort	*Artemisia frigida*
	prairie sagewort	*Artemisia ludoviciana*
	common yarrow	*Achillea millefolium*
	brittle prickly pear cactus	*Opuntia fragilis*
	gumweed	*Grindelia squarrosa*
	tufted white prairie aster	*Aster ericoides*
	stiff goldenrod	*Solidago rigida*
	graceful cinquefoil	*Potentilla gracilis*

Grasses:	Kentucky blue grass	*Poa pratensis*
	western wheat grass	*Agropyron smithii*
	alkali blue grass	*Poa juncifolia*
	smooth brome	*Bromus inermis* (sites 31,38,49)

7.2.2 Shrublands

Shrublands frequently occur in transitions between woodlands and grasslands. Shrubs have been classified into low and tall classes based on their physiognomic structure. Low shrubs include buckbrush (*Symphoricarpos occidentalis*), wild red raspberry (*Rubus idaeus*) and rose species (*Rosa spp).* Low shrublands occur scattered throughout the grasslands, and often form a transitional zone between small aspen stands and the grasslands in the Battle River valley. Tall shrubs include chokecherry (*Prunus virginiana*), aspen (*Populus tremuloides*), saskatoon (*Amelanchier alnifolia*), beaked hazelnut (*Corylus cornuta*), red-osier dogwood (*Cornus stolonifera*), various willow species (*Salix spp.*), river alder (*Alnus tenuifolia*) and silverberry (*Elaeagnus commutata*). Tall shrublands tend to occur in sites with slightly higher moisture conditions in the uplands and the valley bottom. Much of the southern part of the NE quarter of Section 34, Township 40, Range 16 West of the 4th Meridian appears to have been disturbed in the past. Shrublands present in this portion of Section 34 may be a result of regrowth since the removal of the woodland cover in order to extract gravel from the area. It is not clear at this time whether these shrublands are a natural feature or a disturbance feature. Both silverberry and rose species are known to adapt well to disturbances.

7.2.2.1 Low Shrublands

Low shrublands occur primarily on fluvial terraces along the Battle River and less commonly on level to undulating level uplands in the southern portion of the Park. This community grows best in well drained, submesic sites on Orthic Black Chernozemic soils. Buckbrush (*Symphoricarpos occidentalis*) is the dominant low shrub in the Park. Buckbrush often grows densely along the perimeter of small aspen groves or scattered throughout Plains Rough Fescue – Kentucky Blue Grass (*Festuca hallii - Poa pratensis*) grasslands. Two low shrub communities have been identified based on the lack or presence of rose and wild red raspberry as the sub-dominant shrub species. Both low shrubland communities grow in similar site conditions.

Buckbrush (*Symphoricarpos occidentalis*); Plate 6

Several of the field sites listed as part of this community were located in disturbed areas where smooth brome (*Bromus inermis*) cover was extensive. Site 25 was located in the extreme northwest corner of the Park boundary on the Battle River fluvial terrace (Vf3) and Site 63 occurred in an upland disturbance area located in Section 34. Site 63 originally represented a silverberry (*Elaeagnus commutata*) community, however, much of the current silverberry is standing dead shrub and buckbrush has taken over as the dominant shrub.

Buckbush is commonly located growing on slightly elevated Battle River fluvial terraces (Vf3) possessing better quality soils (Black Chernozems) adjacent to slightly lower saline grasslands underlain by Solonetz's and saline phase Regosols. Dense low shrub covers characterize this community.

Vegetation Type: low shrubland

Community: Buckbrush (*Symphoricarpos occidentalis*) (n=10)

Sites:	6, 23C, 25, 29, 30, 33, 37, 58, 63, 66
Slope:	(0-1%)[6], (2-5%)[2], (6-9%), (46-70%)
Aspect:	level[6], E[2], S[2]
Parent Material:	Ft[6], M[3], Ftv/Fa
Surface Texture:	SCL[4], SiCL[3], CL[3]
Subsurface Texture:	SCL[6], SiCL[2], CL, LS
Soil Subgroup:	O.BL[8], O.EB, O.DB
Soil Drainage:	well[9], rapid
Moisture Regime:	submesic[9], subxeric
Nutrient Regime:	mesotrophic[10]
Level 1 Class:	Vf3[7], Vp2, Ss1, Ng1

Vegetation:

Low Shrubs:	buckbrush	*Symphoricarpos occidentalis*
Forbs:	northern bedstraw	*Galium boreale*
	wild bergamot	*Monarda fistulosa*
	prairie sagewort	*Artemisia ludoviciana*
	harebell	*Campanula rotundifolia*
	common yarrow	*Achillea millefolium*
	scouring rush	*Equisetum hyemale*
Grasses:	smooth brome	*Bromus inermis*
	plains rough fescue	*Festuca hallii*
	Kentucky blue grass	*Poa pratensis*
	slender wheatgrass	*Agropyron trachycaulum*
	graceful sedge	*Carex praegracilis*

Buckbrush – Wild Red Raspberry – Rose (*Symphoricarpos occidentalis - Rubus idaeus – Rosa* spp.)

This community is very similar to the pure *Symphoricarpos occidentalis* community except for the presence of significant amounts of rose species (*Rosa* spp.) and wild red raspberry (*Rubus idaeus)*. Site 64, an upland site appears to have have been a buckbrush community at one time, however, gravel extraction has removed most of this shrub cover. Both Sites 1 and 64 have been invaded with smooth brome (*Bromus inermis*).

Vegetation Type: low shrubland

Community: Buckbrush – Wild Red Raspberry – Rose (*Symphoricarpos occidentalis - Rubus idaeus - Rosa* spp*)* (n=3)

Plots:	1 (disturbed), 54, 64 (disturbed)
Slope:	(2-5%)[2], (0-1%)
Aspect:	N, E, level
Parent Material:	Ft[2], M
Surface Texture:	SCL[2], CL
Subsurface Texture:	SCL[2], CL
Soil Subgroup:	O.BL[3]
Soil Drainage:	well[3]
Moisture Regime:	submesic[2], subxeric
Nutrient Regime:	mesotrophic[3]
Level 1 Class:	Vf3[2], Ng1

Vegetation:

Low Shrubs:	buckbrush	*Symphoricarpos occidentalis*
	rose	*Rosa* spp.
	wild red raspberry	*Rubus idaeus*
Forbs:	pasture sagewort	*Artemesia ludoviciana*
	wild bergamot	*Monarda fistulosa*
	scouring rush	*Equisetum hyemale*
	harebell	*Campanula rotundifolia*
	American vetch	*Vicia americana*
	Canada goldenrod	*Solidago canadensis*
Grasses:	Kentucky blue grass	*Poa pratensis*
	plains rough fescue	*Festuca hallii*
	graceful sedge	*Carex praegracilis*
	Sprengel's sedge	*Carex sprengelii*

7.2.2.2 Tall Shrublands

Three tall shrub communities have been identified on dry sites in the Park. In two of these communities silverberry (*Elaeagnus commutata*) is the dominant shrub. They are differentiated from each other on the presence or absence of a dense buckbrush (*Symphoricarpos occidentalis*) understory. The third community consists of chokecherry *(Prunus virginiana*) and saskatoon (*Amelanchier alnifolia*) as the dominant tall shrubs.

Silverberry / Buckbrush (*Elaeagnus commutata / Symphoricarpos occidentalis*); Plate 7

This community grows on submesic sites underlain by Orthic Black Chernozemic soils. Both sample sites representing this community exhibit some disturbance. Site 36 located on a fluvial terrace (Vf3) along the Battle River has been invaded by common nettle (*Urtica dioica*). Site 45 is situated in the upland in the southern part of the Park and is

overgrown with smooth brome (*Bromus inermis*). At Site 45, the silverberry is dying out and buckbrush is taking over as the dominant shrub. Silverberry grows from spreading rhizomes (Johnson et al. 1995), and as a result could be facing competition from the more aggresive smooth brome. The Silverberry / Buckbrush community is generally found on Orthic Black Chernozem soils adjacent to woodlands. Silverberry prefers moist areas, however, it can tolerate dry conditions.

Vegetation Type: tall shrubland

Community: Silverberry / Buckbrush (*Elaeagnus commutata / Symphoricarpos occidentalis*) (n=2)

Sites:	36, 45 (disturbed)
Slope:	(2-5%)[2]
Aspect:	NE, W
Parent Material:	Ft, GFv/M
Surface Texture:	SiCL, SCL
Subsurface Texture:	SCL, gkSiCL
Soil Subgroup:	O.BL[2]
Soil Drainage:	well, moderately well
Moisture Regime:	submesic[2]
Nutrient Regime:	mesotrophic[2]
Level 1 Class:	Vf3, D1

Vegetation:

Tall Shrubs:	silverberry	*Elaeagnus commutata*
Low Shrubs:	buckbrush	*Symphoricarpos occidentalis*
Forbs:	common nettle	*Urtica dioica* (Site 45)
	Canada thistle	*Cirsium arvense*
	Canada goldenrod	*Solidago canadensis*
Grasses:	smooth brome	*Bromus inermis*
	sedge species	*Carex* spp.

Silverberry (*Elaeagnus commutata*)

This community differs from the previous community in that it lacks a buckbrush understory and occurs primarily on level and slightly drier upland morainal deposits (Ng1) and morainal deposits overlain by coarser glaciofluvial veneers (Ss1). Canada thistle (*Cirsium arvense*) and smooth brome (*Bromus inermis*) have invaded Site 16.

Vegetation Type: tall shrubland

Community: Silverberry (*Elaeagnus commutata)* (n=2)

Plots:	16, 23B
Slope:	(0-1%), (2-5%)
Aspect:	N, S
Parent Material:	GFv/M, M
Surface Texture:	gkCL, CL
Subsurface Texture:	gkSL, SCL
Soil Subgroup:	O.BL[2]
Soil Drainage:	rapid, well
Moisture Regime:	subxeric, submesic
Nutrient Regime:	mesotrophic[2]
Level 1 Class:	Ss1, Ng1

Vegetation:

Tall Shrubs:	silverberry	*Elaeagnus commutata*
Forbs:	Canada thistle	*Cirsium arvense*
	common nettle	*Urtica dioica*
Grasses:	Kentucky blue grass	*Poa pratensis*
	smooth brome	*Bromus inermis*

Choke Cherry – Saskatoon (*Prunus virginiana - Amelanchier alnifolia*)

This tall shrub community is associated with well drained sites on both fluvial terraces (Vf3), the upper portion of the north facing Battle River valley slope (Vp1) and upland morainal deposits (Ng1) within the Park. Vegetation in the lower strata and site conditions are similar to those found in the Aspen / Choke Cherry – Saskatoon (*Populus tremuloides / Prunus virginiana - Amelanchier alnifolia*) community. Well drained Orthic Eutric Brunisols are the dominant soils underlying this community. Red-osier dogwood (*Cornus stolonifera*) and beaked hazelnut (*Corylus cornuta*) were minor shrub components at Site 56. This site was located on a steep north facing slope adjacent to the river.

Vegetation Type: tall shrubland

Community: Choke Cherry – Saskatoon (*Prunus virginiana - Amelanchier alnifolia*) (n=2)

Sites:	39, 56
Slope:	(2-5%), (31-45%)
Aspect:	W, N
Parent Material:	Ft, Mvb/R
Surface Texture:	SiCL, CL
Subsurface Texture:	SiCL[2]
Soil Subgroup:	O.EB[2]
Soil Drainage:	well[2]
Moisture Regime:	mesic[2]
Nutrient Regime:	mesotrophic[2]
Level 1 Class:	Vf3, Vp1

Vegetation:

Tall Shrubs:	choke cherry	*Prunus virginiana*
	saskatoon	*Amelanchier alnifolia*
	red osier dogwood*	*Cornus stolonifera*
	beaked hazelnut*	*Corylus cornuta*
Forbs:	showy aster	*Aster conspicuus*
	wild sarsparilla	*Aralia nudicaulis*
	Canada violet	*Viola canadensis*
	fringed loosestrife	*Lysimachia ciliata*
Grasses:	purple oat grass	*Schizachne purpurascens*

*minor shrub components at Site 56.

7.2.3 Woodlands

Woodland communities are extensive throughout the Park. They occur on the uplands in the south, in the in the Big Knife Creek valley, on the Battle River north-facing slopes, and in slight depressional areas, fluvial terraces and weakly saline fluvial aprons in the Battle River valley. Woodlands have been subdivided into deciduous, mixedwood and coniferous categories based on the occurrence and proportion of the dominant overstory tree species. The aspen stands have been further subdivided into communities according to their dominant shrub understories, which reveal distinct relationships with the moisture gradient associated with topographic slope position. Tall stands of white spruce grow in the floodplain of Big Knife Creek. These coniferous stands give way to mixedwood stands on the slightly drier, lower north-facing valley slopes, which in turn grade into deciduous stands on the mid and upper valley slope positions and the uplands. Deciduous stands also occur on the fluvial terraces along the Battle River.

7.2.3.1 Deciduous Woodlands

Deciduous woodlands are located on the north-facing slopes of the Battle River valley, on mid and upper north-facing slopes of the Big Knife Creek valley, the upland area in the south, and in remnant drainage channels or on slightly raised fluvial terraces along the Battle River.

Aspen / Buckbrush - Wild Red Raspberry- Rose (*Populus tremuloides / Symphoricarpos occidentalis - Rubus idaeus – Rosa* spp.); Plate 8

This deciduous / low shrub community is commonly associated with level, well drained terrain. The dominant parent material is medium textured morainal deposits overlain by coarser glaciofluvial veneers (Ss1) and medium textured till at the surface (Ng1) in the

southern upland. This community also occurs occasionally on the Battle River fluvial terrace (Vf3). This is the driest woodland community observed in the Park. The forb cover in the understory is low and less diverse compared to the more moist mixed and coniferous woodland sites. Low shrub density is very high and grasses tend to be quite prominent in this dry woodland community. The growth of native grasses is limited by the presence of the extremely invasive smooth brome (*Bromus inermis)*. Smooth brome was recorded was recorded at a majority of these sites with covers as high as 50%. Traces of tall shrubs species invading from neighboring shrublands were evident especially around the perimeter of these deciduous stands. Dominant soils underlying this community are well drained Orthic Black Chernozems. Extensive aspen poplar regeneration is evident in stands with open tree canopies. One site (Site 2) was investigated on the Battle River fluvial terrace (Vf3). It was adjacent to the campground and open playing field (D4). The remaining sites representing this community were all located on the uplands.

Vegetayion Type: deciduous woodland

Community: Aspen / Buckbrush - Wild Red Raspberry-Rose (*Populus tremuloides / Symphoricarpos occidentalis - Rubus idaeus - Rosa* spp.) (n=5)

Sites:	2,17, 18, 19 (disturbed), 62
Slope:	(0-1%)[4], (2-5%)
Aspect:	N[4], level
Parent Material:	GFv/M[3], GFb/M, Ft
Surface Texture:	CL[2], gkCL, SCL, SL
Subsurface Texture:	SCL, gkSCL, gkCL, SL
Soil Subgroup:	O.BL[5]
Soil Drainage:	well[5]
Moisture Regime:	mesic[3], submesic[2]
Nutrient Regime:	mesotrophic[5]
Level 1 Class:	Ss1[4], Vf3

Vegetation:		
Trees:	aspen	*Populus tremuloides*
Low Shrubs:	buckbrush	*Symphoricarpos occidentalis*
	wild red raspberry	*Rubus idaeus*
	rose	*Rosa* spp.
Forbs:	northern bedstraw	*Galium boreale*
	veiny meadow rue	*Thalictrum venulosum*
	purple peavine	*Lathyrus venulosum*
	red and white baneberry	*Actaea rubra*
	wild sarsparilla	*Aralia nudicaulis*
	cream colored vetchling	*Lathyrus ochroleucus*
	Canada goldenrod	*Solidago canadensis*
Grasses:	smooth brome	*Bromus inermis*
	Sprengel's sedge	*Carex sprengelii*
	purple oat grass	*Schizachne purpurascens*
	Kentucky blue grass	*Poa pratensis*
	slender wheat grass	*Agropyron trachycaulum*

Aspen / Buckbrush - Wild Red Raspberry - Rose (*Populus tremuloides / Symphoricarpos occidentalis - Rubus idaeus – Rosa* spp.) (hygric site conditions)

This community is distinguished from the previous community based on the presence of higher moisture and nutrient levels. This community occurs on sites such as remnant drainage channels carved into the Battle River terraces east of Big Knife Creek (Vf7). Drainage at these sites is generally imperfect and the dominant soils are Gleyed Black Chernozems and Gleyed Black Solod's. Aspen regeneration, shrub densities and forb covers are generally low and similar to the previous drier deciduous aspen community. This community differs from the drier aspen community in that it has very low densities of grass cover.

Vegetation Type: deciduous woodland

Community: Aspen / Buckbrush - Wild Red Raspberry - Rose (*Populus tremuloides / Symphoricarpos occidentalis - Rubus idaeus - Rosa* spp.) – hygric site conditions (n=2)

Sites:	7, 55
Slope:	(10-15%), (2-5%)
Aspect:	E, N
Parent Material:	Ft, Fa
Surface Texture:	SiCL, C
Subsurface Texture:	SiCL, C
Soil Subgroup:	GL.BL, GLBL.SO
Soil Drainage:	imperfect[2]
Moisture Regime:	hygric[2]
Nutrient Regime:	permesotrophic, hypereutrophic
Level 1 Class:	Vf7[2]

Vegetation:

Trees:	aspen	*Populus tremuloides*
Tall Shrubs:	aspen	*Populus tremuloides*
	beaked willow	*Salix bebbiana*
Low Shrubs:	buckbrush	*Symphoricarpos occidentalis*
	wild red raspberry	*Rubus idaeus*
	rose species	*Rosa* spp.
	narrow-leaved meadowsweet	*Spirea alba* (minor component at Plot 55)
Forbs:	northern bedstraw	*Galium boreale*
	agrimony	*Agrimony striata*
	veiny meadow rue	*Thalictrum venulosum*
	wild strawberry	*Fragaria virginiana*
Grasses:	Sprengel's sedge	*Carex sprengelii*
	Kentucky blue grass	*Poa pratensis*

Aspen / Choke Cherry - Saskatoon (*Populus tremuloides / Prunus virginiana - Amelanchier alnifolia*); Plate 9

This community occurs on drier sites located on the well drained upper portion of the north facing valley slope (Vp1), the northern perimeter of the uplands (Ng1, Ss1), and the fluvial terraces (Vf3) and fluvial aprons (Vp3) in the valley bottom. Orthic Black Chernozems are the most common soils at these sites with the exception of Site 34 which was underlain by a well drained saline phase Cumulic Regosol developed on a fluvial apron. Apron textures ranged from of medium to coarse. The floral diversity in this community reflects the mesic and mesotrophic site conditions. Aspen regeneration was most evident at Sites 8 and 27 with covers of 26% and 20% respectively. Minor amounts of buckbrush (*Symphoricarpos occidentalis*) and red-osier dogwood (*Cornus stolonifera*) were observed at all sites. Several grass species were also present in trace amounts. Smooth brome encroachment into the stand was measured near Site 8, which was located just off of the hiking trail on the upland in the southwest corner of the park. Smooth brome has invaded off the trail 16 m into the aspen stand. Site 8 was located just past the extent of this invasion.

Vegetation Type: deciduous woodland

Community: Aspen / Choke Cherry - Saskatoon (*Populus tremuloides / Prunus virginiana - Amelanchier alnifolia*) (n=3)

Sites:	8, 27, 34
Slope:	(6-9%)[2], (0-1%)
Aspect:	N, SW, E
Parent Material:	GFv/M, Ft, Ff
Surface Texture:	SL, SiCL, CL
Subsurface Texture:	LS, SiCL, SL
Soil Subgroup:	O.BL[2], CU.R (saline phase)
Soil Drainage:	well[3]
Moisture Regime:	mesic[3]
Nutrient Regime:	mesotrophic[3]
Level 1 Class:	Ss1, Vf3, Vp3

Vegetation:

Trees:	aspen	*Populus tremuloides*
Tall Shrubs:	saskatoon	*Amelanchier alnifolia*
	choke cherry	*Prunus virginiana*
	aspen poplar	*Populus tremuloides*
	red osier dogwood	*Cornus stolonifera* (a relatively small component)
	beaked willow	*Salix bebbiana*
Low Shrubs:	rose species	*Rosa* spp.
	buckbrush	*Symphoricarpos occidentalis*
Forbs:	veiny meadow rue	*Thalictrum venulosum*
	star-flowered Solomon's seal	*Smilicina stellata*

	Canada violet	*Viola canadensis*
	Lindley's aster	*Aster ciliolatus*
	sweet-scented bedstraw	*Galium triflorum*
	northern bedstraw	*Galium boreale*
	wild lily-of-the-valley	*Maianthemum canadense*
	red and white baneberry	*Acta rubra*
	twinflower	*Linnea borealis*
	wild sarsparilla	*Arailia nudicaulis*
	agrimony	*Agrimonia striata* (Plot 34)
Grasses:	smooth brome	*Bromus inermis* (invading plot 27)
	purple oat grass	*Schizachne purpurascens*

Aspen - Balsam Poplar (White Spruce - Black Spruce) / Beaked Hazelnut (*Populus tremuloides - Populus balsamifera* (*Picea glauca - Picea mariana*) / *Corylus cornuta*); Plate 10

This community (Plate 10) occurs on the mid slope position of the north facing valley slopes overlain by morainal veneers and blankets over bedrock (Vp1) and on a remnant morainal upland that has slumped to a lower level (Ng2). Old rotational slumps are evident on these north facing slopes. Orthic Eutric Brunisols are the common soil subgroup on these slopes, which range in inclination from 10% to 60%. The finer soil textures, moderate slopes and slope position provide more moist site conditions compared to the upper slopes. Shrub cover is very high and diverse in this community. Sites 10 and 35 best represent this community. Sites 9 and 44 are located in a mid to upper slope position and the communities present are transitional to the drier Aspen / Choke Cherry - Saskatoon (*Populus tremuloides / Prunus virginiana - Amelanchier alnifolia*) community located upslope. Cover values for choke cherry and saskatoon are only slightly lower than the values for beaked hazelnut (*Corylus cornuta*) in Sites 9 and 44. These sites have been included as part of this mid-slope community due to the similarity in soil types and the prominance of beaked hazelnut. Site 48 on the remnant morainal upland is transitional to the wetter and richer Aspen - Balsam Poplar / Red-osier Dogwood (*Populus tremuloides - Populus balsamifera / Cornus stolonifera*) community on the lower slopes. Red-osier dogwood was a minor component at all field sites. Wild sarsparilla (*Aralia nudicaulis*) was the major forb species in this community with covers ranging from 15 to 60%. Grasses and sedges were very sparse.

Vegetation Type: deciduous woodland

Community: Aspen - Balsam Poplar (White Spruce - Black Spruce) / Beaked hazelnut (*Populus tremuloides - Populus balsamifera* (*Picea glauca - Picea mariana*) / *Corylus cornuta*) (n=5)

Sites:	9, 10, 35, 44, 48
Slope:	(16-30%)[2], (46-70%)[2], (2-5%)
Aspect:	NE[3], N[2]
Parent Material:	Mvb/R[4], M
Surface Texture:	CL[4], SCL
Subsurface Texture:	CL[4], SL
Soil Subgroup:	O.EB[4], SZ.BL
Soil Drainage:	well[3], rapid, moderately well

Moisture Regime:	mesic[3], subhygric[2]
Nutrient Regime:	mesotrophic[4], permesotrophic
Level 1 Class:	Vp1[4], Ng2

Vegetation:

Trees:	aspen	*Populus tremuloides*
	balsam poplar	*Populus balsamifera*
Tall Shrubs:	beaked hazelnut	*Corylus cornuta*
	choke cherry	*Prunus virginiana*
	red-osier dogwood	*Cornus stolonifera*
	saskatoon	*Amelanchier alnifolia*
	twining honeysuckle	*Lonicera dioica* (trace)
Low Shrubs:	rose	*Rosa* spp.
	wild red raspberry	*Rubus idaeus*
Forbs:	wild sarsparilla	*Aralia nudicaulis*
	bunchberry	*Cornus canadensis*
	dewberry	*Rubus pubescens*
	veiny meadow rue	*Thalictrum venulosum*
	Canada violet	*Viola canadensis*
	sweet-scented bedstraw	*Galium triflorum*
	fairybells	*Disporum trachycarpum*
	twinflower	*Linnea borealis*
	wild vetch	*Vicia americana*

Aspen - Balsam Poplar / Red-osier Dogwood (*Populus tremuloides - Populus balsamifera / Cornus stolonifera*)

This deciduous community is associated with well to moderately well drained fluvial aprons (Vp3), which make up the lower portion of the north facing slopes in the Battle River valley. The gently sloping fluvial aprons (5 to 10% in inclination) located at the base of the tree covered Battle River valley slopes provide moist subhygric and nutrient-rich site conditions suitable for woody species such as balsam poplar (*Populus balsamifera*) and red-osier dogwood (*Cornus stolonifera*). Dense understory covers (up to 25%) of wild sarsparilla (*Aralia nudicaulis*) are also indicative of the moister and often richer site conditions. Soil surface textures range from medium to coarse. Soils developed on these lower slopes and fluvial fans range from well to moderately well drained Solonetzic Black Chernozems to less well developed Cumulic Regosols. Fluvial fan deposits under these deciduous woodlands are less saline compared to the parent material that underlies the sparse Kentucky Blue Grass – Western Wheat Grass community. These fan deposits are derived primarily from till material overlying upper slopes rather than saline Upper Cretaceous Bearpaw bedrock. Tall shrubs form a very major component of this deciduous woodland community with covers frequently exceeding 80%.

Vegetation Type: deciduous woodland

Community: Aspen - Balsam Poplar / Red-osier Dogwood (*Populus tremuloides - Populus balsamifera / Cornus stolonifera*) (n=2)

Sites:	50, 70
Slope:	(6-9%)[2]
Aspect:	NE, N
Parent Material:	Fa[2]
Surface Texture:	CL, SL
Subsurface Texture:	SL[2]
Soil Subgroup:	SZ.BL, CU.R
Soil Drainage:	moderately well, well
Moisture Regime:	subhygric[2]
Nutrient Regime:	permesotrophic[2]
Level 1 Class:	Vp3[2]

Vegetation:

Trees:	aspen	*Populus tremuloides*
	balsam poplar	*Populus balsamifera*
Tall Shrubs:	red-osier dogwood	*Cornus stolonifera*
	saskatoon	*Amelanchier alnifolia* (small component)
	choke cherry	*Prunus virginiana* (small component)
Low Shrubs:	wild red raspberry	*Rubus idaeus*
	rose	*Rosa* spp.
Forbs:	wild sarsparilla	*Aralia nudicaulis*
	star-flowered Solomon's seal	*Smilicina stellata*
	wild lily-of-the-valley	*Maianthemum canadense*
Grasses:	marsh reed grass	*Calamagrostis canadensis*
	purple oat grass	*Schizachne purpurascens*

7.2.3.2 Mixed Woodlands

A mixed woodland is defined as a stand in which 20% of the canopy is deciduous tree cover and the remaining 80% is coniferous (Beckingham et al. 1996). Mixed woodland occurs in transition zones between the coniferous woodlands in the Big Knife Creek floodplain and deciduous woodlands on the middle and upper north facing valley slopes.

White Spruce - Aspen (Balsam Poplar) Rose (*Picea glauca - Populus tremuloides (Populus balsamifera) / Rosa*)

This community is prominent on the lower portion of north-facing slopes (Vp1) where thin fluvial apron or colluvial veneers overlay morainal deposits in close proximity to the floodplains of Big Knife Creek and its unnamed tributary. Surface textures of these deposits range from medium to fine. Well to moderately well drained Orthic Eutric Brunisols are

dominant soils. Cumulic Regosols grading to Eutric Brunisols are found adjacent to the upper bank of an intermittent creek that flows into Big Knife Creek. Forb diversity is higher here than in the adjacent coniferous woodlands. Balsam poplar (*Populus balsamifera*) is often present especially in sites with higher moisture levels. Shrub cover is generally low, however, some tall shrubs encroaching from adjacent wetlands may be evident. Rose was the dominant low shrub.

Vegetation Type: mixed woodland
Community: White Spruce-Aspen (Balsam Poplar) / Rose (*Picea glauca - Populus tremuloides* (*Populus balsamifera*) / *Rosa* spp.) (n=2)

Sites:	11, 43
Slope:	(10-15%), (16-30%)
Aspect:	NW, NE
Parent Material:	Fav/M, Cv/M
Surface Texture:	CL[2]
Subsurface Texture:	CL, C
Soil Subgroup:	CU.R, O.EB
Soil Drainage:	moderately well, well
Moisture Regime:	subhygric, mesic
Nutrient Regime:	mesotrophic[2]
Level 1 Class:	Vp1[2]

Vegetation:		
Trees:	white spruce	*Picea glauca*
	aspen	*Populus tremuloides*
	balsam poplar	*Populus balsamifera*
Low Shrubs:	rose species	*Rosa* spp.
Forbs:	wild sarsparilla	*Aralia nudicaulis*
	Canada violet	*Viola canadensis*
	northern bedstraw	*Galium boreale*
	wild strawberry	*Fragaria virginiana*
	bunchberry	*Cornus canadensis*
	dewberry	*Rubus pubescens*
Grasses:	slender wheat grass	*Agropyron trachycaulum*
	hairy wild rye	*Elymus innovatus*
	purple oat grass	*Schizachne purpurascens*
Mosses:		*Brachythecium* spp.

7.2.3.2 Coniferous Woodlands

Coniferous woodlands are found on the floodplain of Big Knife Creek with extensions into the adjacent lower valley slopes all way to the Creek's confluence with the Battle River.

White Spruce / Rose (*Picea glauca / Rosa*); Plate 11

The floodplain of Big Knife Creek consists of the current stream channel and adjacent terrain, which is slightly higher and drier. Pure stands of white spruce grow on these raised surfaces (Vf2) as well as drier sites in the channel (Vf1). Forb cover is limited due to the low light and moisture conditions under these dense spruce stands. The fluvial parent material is coarse textured and drains rapidly resulting in submesic conditions to shallow rooted understory plants. The feather moss ground cover is quite variable and is most lush under a dense spruce canopy where shading causes more moist surface conditions. In some sites spruce needle cover on the ground is very thick and continuous (e.g. Site 40). This thick needle cover and loose loamy sand texture fluvial deposits creates suitable conditions for establishing large red ant colonies. Several ant mounds observed near Site 40 were close to one meter in height. Dominant soils underlying these communities range from well to rapidly drained Orthic Regosols to Orthic Eutric Brunisols. Forb cover under these spruce stands is much lower than in the other woodland communities and often occurs only in trace amounts. White Spruce / Rose communities also occur occasionally on moist sites on the lower slopes of fluvial aprons (Vp3) adjacent to the Big Knife Creek valley bottom.

Vegetation Type: coniferous woodland
Community: White Spruce / Rose (*Picea glauca / Rosa* spp.) (n=4)

Sites:	13, 40, 41, 42
Slope:	(2-5%)[3], (16-30%)
Aspect:	N[2], W[2]
Parent Material:	Fo[3], Fa
Surface Texture:	SL[2], LS, SiCL
Subsurface Texture:	S[2], SCL, SiCL
Soil Subgroup:	O.EB[2], O.R, BL.SS
Soil Drainage:	well[2], rapid[2]
Moisture Regime:	submesic[2], mesic, subxeric
Nutrient Regime:	mesotrophic[3], submesotrophic
Level 1 Class:	Vf2[2], Vf1, Vp3

Vegetation:		
Trees:	white spruce	*Picea glauca*
Low Shrubs:	rose	*Rosa* spp.
Forbs:	wild sarsparilla	*Arailia nudicaulis*
	wild strawberry	*Fragaria virginiana*
	woodland strawberry	*Fragaria vesca*
	veiny meadow rue	*Thalictrum venulosum*
	twinflower	*Linnaea borealis*
	bunchberry	*Cornus canadensis*
Grasses:	slender wheat grass	*Agropyron trachycaulum*
	purple oat grass	*Schizachne purpurascens*

Mosses: *Pleurozium schreberi*
Hylocomium splendens
Brachythecium spp.

7.3 Wetlands

Wetlands occur primarily on the current floodplain and the lower fluvial terraces along the Battle River and the Big Knife Creek. Battle River water levels are influenced by a dam located approximately 5.8 km downstream of the eastern edge of the Park. Impoundment of river water behind this dam has created the Forestburg Reservoir which extends upstream along the north edge of the Park. The Reservoir has increased the level of the water and reduced the flow of the Battle River north of the Park. Vast expanses of cattails grow along the edge of the Battle River and also appear as islands of emergent vegetation in the middle of the river channel. Wet tall shrublands and wet meadows often occur adjacent to these deep marshes on the floodplain or lower terraces of the river. An area of wet tall shrublands also occurs in the poorly drained portion of the Big Knife Creek floodplain near the western boundary of the Park. Shallow marshes and wet meadows are found in old abandoned channels and old oxbow lakes on the Battle River fluvial terraces. Two springs discharging from the mid-slope positions are found on the broad north-facing Battle River valley slope.

7.3.1 Wet Tall Shrublands

(White Spruce) / Willow -River Alder - Red-osier Dogwood (*Picea glauca / Salix* spp. - *Alnus tenuifolia - Cornus stolonifera*); Plates 12 and 13

Wet tall shrublands occur on level to very gentle sloping sites on the Battle River (Vf5) and Big Knife Creek (Vf2) floodplains. Poorly drained Rego Gleysols grading to imperfectly drained Gleyed Cumulic Regosols are common soil subgroups underlying this community on the Big Knife Creek and Battle River floodplains. Soil surface textures range from coarse to medium. Site moisture levels range from subhygric to subhydric and the site nutrient regime is rated eutrophic. Scattered, older white spruce are evident thoughout this community. The dense shrub cover (generally exceeding 75%) reduces light to lower strata, resulting in low forb and grass covers. Site 14 was an exception. The shrub canopy was very open (around 22%) and the underlying grass growth was quite dense. Site 20 is occurs at the base of a fluvial fan (Vp3), which grades into the floodplain of Big Knife Creek. Site conditions here are drier than those found in typical wet tall shrubland sites on the floodplain. This wet tall shrubland community is probably encroaching into these lower fluvial fan sites from the wetter areas in the floodplain.

Vegetation Type: wet tall shrubland, wetland
Community: (White Spruce) / Willow - River Alder - Red-osier Dogwood ((*Picea glauca*) / *Salix* - *Alnus tenuifolia* - *Cornus stolonifera*) (n=3)

Sites: 4, 14, 20, 24, 51
Slope: (2-5%)[4], (0-1%)

Aspect:	S[2], SW, NE, level	
Parent Material:	Fo[4], Fa	
Surface Texture:	SiCL[3], LS[2]	
Subsurface Texture:	SiCL[2], SCL, SL, LS	
Soil Subgroup:	R.G[2], O.HG, O.G, CU.R	
Soil Drainage:	poor[4], well	
Moisture Regime:	hygric[2], subhygric[2], subhydric	
Nutrient Regime:	eutrophic[5]	
Level 1 Class:	Vf5[3], Vf2, Vp3	

Vegetation:

Trees:	white spruce	*Picea glauca* (occasional)
Tall Shrubs:	beaked willow	*Salix bebbiana*
	river alder	*Alnus tenuifolia*
	red-osier dogwood	*Cornus stolonifera*
	pussy willow	*Salix discolor*
	choke cherry	*Prunus virginiana* (minor component in raised areas)
	sandbar willow	*Salix exigua*
	pin cherry	*Prunus pensylvanica* (minor component in raised areas)
	balsam poplar	*Populus balsamifera*
Low Shrubs:	rose	*Rosa* spp.
	wild red raspberry	*Rubus idaeus*
	currant species	*Ribes* spp.
Forbs:	veiny meadow rue	*Thalictrum venulosum*
	star-flowered Solomon's seal	*Smilicina stellata*
	Canada goldenrod	*Solidago canadensis*
	snakeroot	*Sanicula marilandica*
	red and white baneberry	*Acta rubra*
	large-leaved yellow avens	*Geum macrophyllum*
	yellow avens	*Geum aleppicum*
	common horsetail	*Equisetum arvense*
	canada thistle	*Cirsium arvense*
	northern bedstraw	*Galium boreale*
	Lindley's aster	*Aster ciliolatus*
Grasses:	slender wheat grass	*Agropyron trachycaulum* (trace)
	marsh reed grass	*Calamagrostis canadensis*
	northern reed grass	*Calamagrostis inexpansa*
	sedge species	*Carex* spp.

7.3.2 Wet Meadows

Wet meadows occur in old abandoned river channels and oxbow lakes on the higher Battle River terraces and below two springs discharging from midslope positions on the north facing Battle River valley slopes. These sites are generally high in moisture due to the impeded drainage and are rich in plant nutrients. Standing water tends to occur only for short durations throughout the year (ie. snow melt, after a heavy rainfall). Wet meadows tend to be more floristically diverse than shallow marshes (Millar, 1976) and tend to be dominated by low to intermediate grasses, sedges and forbs (Adams, 1988).

Some of the sampled sites classified as wet meadows appear to be marsh-meadow transitions. Moisture levels at these sites are similar and in some cases higher than in shallow marshes, however, the vegetation community is more diverse than that found in the shallow marsh sites.

7.3.2.1 Wet Grass Meadow

Redtop - Slough Grass - Foxtail Barley - Marsh Reed Grass (*Agrostis alba - Beckmannia syzigachne - Hordeum jubatum - Calamagrostis canadensis*)

Wet grass meadows are associated with the lower level of the Battle River floodplain (WdVf5) and with local fine textured lacustrine deposits laid down in remnant fluvial channels (Vf7) on the upper terraces of the Battle River. Grasses prefer slightly drier conditions than sedges. Two very distinct wet grass meadows were sampled.

Site 52, located in an old fluvial channel, had saline site conditions. This was evident from the presence of salt tolerant species such as red top (*Agrostis stolonifera*), slough grass (*Beckmannia syzigachne*), gumweed (*Grindelia squarrosa*) and foxtail barley (*Hordeum jubatum*). The soil identified at this site was an imperfectly drained Gleyed Black Solod with a well developed hardpan layer in the Bnt horizon. This wet meadow had hygric moisture conditions.

Site 5 represented a marsh reed grass (*Calamagrostis canadensis*) dominant meadow located along the Battle River floodplain. Very poor drainage conditions have created hydric conditions. This wet grass meadow type grades to the deep marsh vegetation type all along the Battle River. Small amounts of sedge (*Carex* spp.) were present at this site.

Vegetation Type: wet meadow
Community: Redtop - Slough Grass - Foxtail Barley - Marsh Reed Grass (*Agrostis alba - Beckmannia syzigachne - Hordeum jubatum - Calamagrostis canadensis*) (n=2)

Sites:	5, 52,
Slope:	$(0\text{-}1\%)^2$
Aspect:	$level^2$
Parent Material:	Fo, Lv/Ft

Surface Texture:	SiCL, C
Subsurface Texture:	SCL, C
Soil Subgroup:	R.G, GLBL.SO
Soil Drainage:	very poor, imperfect
Moisture Regime:	hydric, hygric
Nutrient Regime:	eutrophic, hypereutrophic
Level 1 Class:	WdVf5, Vf7

Vegetation:

Forbs:	western dock	*Rumex occidentalis*
	Canada thistle	*Cirsium arvense*
	gumweed	*Grindelia squarrosa*
Grasses:	marsh reed grass	*Calamagrostis canadensis* (Site 5)
	awned sedge	*Carex atheroides* (Site 5)
	common tall mana grass	*Glyceria grandis* (Site 5)
	redtop	*Agrostis stolonifera*
	slough grass	*Beckmannia syzigachne*
	foxtail barley	*Hordeum jubatum*
	short-awned foxtail	*Alopecurus aequalis*

7.3.2.2 Wet Meadow - Spring

Water sedge - Awned Sedge (*Carex atherodes - Carex aquatilus*)

Two springs (Vs) exist within the Park (Greenlee, 1983). They are both located at mid-slope positions on the north-facing Battle River valley slope. The underlying parent materials on these slopes are morainal veneers and blankets over bedrock. The spring located in the eastern half of the Park was sampled as Site 46. Below the spring the soil was a medium textured very poorly drained Rego Gleysol. Standing water and marsh-like conditions occur at the point where the spring discharges from the slope. The area below the spring is floristically diverse and more representative of a wet meadow. Below this wet meadow is a fan of deposited fine textured mineral material on which a mixedwood tree cover has developed. Water sedge (*Carex aquatilus*) and awned sedge (*Carex atherodes*) are the dominant vegetation species growing in the wet meadow at the base of the spring. There is also a diversity of forbs growing around the edge of this meadow due to the increased subsurface moisture and nutrients provided by the spring.

Vegetation Type: wet meadow - spring
Community: Water sedge - Awned Sedge (*Carex atherodes - Carex aquatilus*) (n=1)

Sites:	46
Slope:	(10-15%)
Aspect:	NE
Parent Material:	Mvb/R

Surface Texture:	CL	
Subsurface Texture:	CL	
Soil Subgroup:	R.G	
Soil Drainage:	very poor	
Moisture Regime:	hydric	
Nutrient Regime:	eutrophic	
Level 1 Class:	Vs	
Vegetation:		
Forbs:	common tall sunflower just down slope of spring and wet meadow is a diverse range of forbs	*Helianthus nuttallii*
Grasses:	water sedge awned sedge	*Carex atherodes* *Carex aquatilus*

7.3.3 Shallow Marsh

Shallow marshes are located in dry oxbow lakes (Vf6, Vf7) and along the current Battle River channel. Water levels tend to remain high in these areas well into the summer. Poor drainage and fine soil textures restrict soil moisture movement, which creates subhydric moisture conditions. These depressional areas contain very poorly to poorly drained Rego Gleysolic soils. Shallow marshes are distinguished from wet meadows by the occurrence of standing water for longer durations, often well into summer, and decreased floral diversity. This vegetation type is often found adjacent to deep marshes. Hydrophytic plant species are the major constituent in this vegetation type. Two communities were identified based on the dominant graminoid form. Site conditions were similar for both communities.

7.3.3.1 Shallow Marsh - Sedge

Awned sedge (*Carex atherodes*); Plate 14

The two shallow marshes that were sampled (Sites 28 & 65) were predominantly vegetated with awned sedge (*Carex atheroides*) with only a trace of other forbs.
Vegetation Type: shallow marsh
Community: Awned Sedge (*Carex atherodes*) (n=2)

Sites:	28, 65
Slope:	(0-1%)[2]
Aspect:	level[2]
Parent Material:	Lv/Ft[2]
Surface Texture:	hC, SiC
Subsurface Texture:	hC, SiC
Soil Subgroup:	R.G[2]
Soil Drainage:	poor[2]
Moisture Regime:	subhydric[2]
Nutrient Regime:	permesotrophic, eutrophic
Level 1 Class:	Vf6, Vf7

Vegetation:

Grasses:	awned sedge	*Carex atherodes*

7.3.3.2 Shallow Marsh - Sedge & Grass

Awned sedge - Common Tall Manna Grass (*Carex atherodes - Glyceria grandis*)

This shallow marsh type was located in an old oxbow lake situated on a fluvial terrace. Very poor drainage and slow moisture perviousness due to the fine silty clay textures of the underlying lacustrine deposits and high water table have resulted in subhydric site conditions.

Vegetation Type: shallow marsh
Community: Awned sedge - Common Tall Manna Grass (*Carex atherodes - Glyceria grandis*) (n=1)

Sites:	32
Slope:	(0-1%)
Aspect:	level
Parent Material:	Lv/Ft
Surface Texture:	SiC
Subsurface Texture:	SiC
Soil Subgroup:	R.G
Soil Drainage:	poor
Moisture Regime:	subhydric
Nutrient Regime:	eutrophic
Level 1 Class:	Vf6

Vegetation:

Forbs:	curled dock	*Rumex crispus* (only in trace amounts)
Grasses:	awned sedge	*Carex atherodes*
	common tall manna grass	*Glyceria grandis*

7.3.4 Deep Marsh

Deep Marshes have developed in the lower levels of the Battle River floodplain (Wd) where there is permanent standing water. Note: All of the deep marsh area extends beyond the official Order in Council northern park boundary which is marked by the 668.7 m (2194 ft) above sea level contour line which marks the full supply level of the Forestburg Reservoir.

Common Cattail Marsh ; Plates 15 & 16

This wetland community occurs along the shores of the Battle River and as islands of emergent vegetation in the central part of the river. Very poorly drained Rego Gleysols are the dominant soils. Common cattail (*Typha latifolia*) is the dominant plant species with the presence of some bulrush species (*Scirpus* spp.), giant bur-reed (*Sparganium eurycarpum*) and sedges (*Carex* spp).

Vegetation Type: deep marsh
Community: Common Cattail (*Typha latifolia*) (n=1)

Plots:	26
Slope:	(0-1%)
Aspect:	level
Parent Material:	Fo
Surface Texture:	CL
Subsurface Texture:	CL
Soil Subgroup:	R.G
Soil Drainage:	very poor
Moisture Regime:	hydric
Nutrient Regime:	eutrophic
Level 1 Class:	Wd

Vegetation:

Forbs:	common cattail	*Typha latifolia*
Grasses:	small bottle sedge	*Carex utriculata*

7.4 Overview of Park Vegetation

See Table 3 for a descriptive summary of the vegetation communities and associated site conditions found within Big Knife Provincial Park. Figure 2 below displays the topographic sequence of woodland community types found on the southern upland, north-facing Battle River valley slope, fluvial aprons, and the fluvial terraces and floodplain of the Battle River.

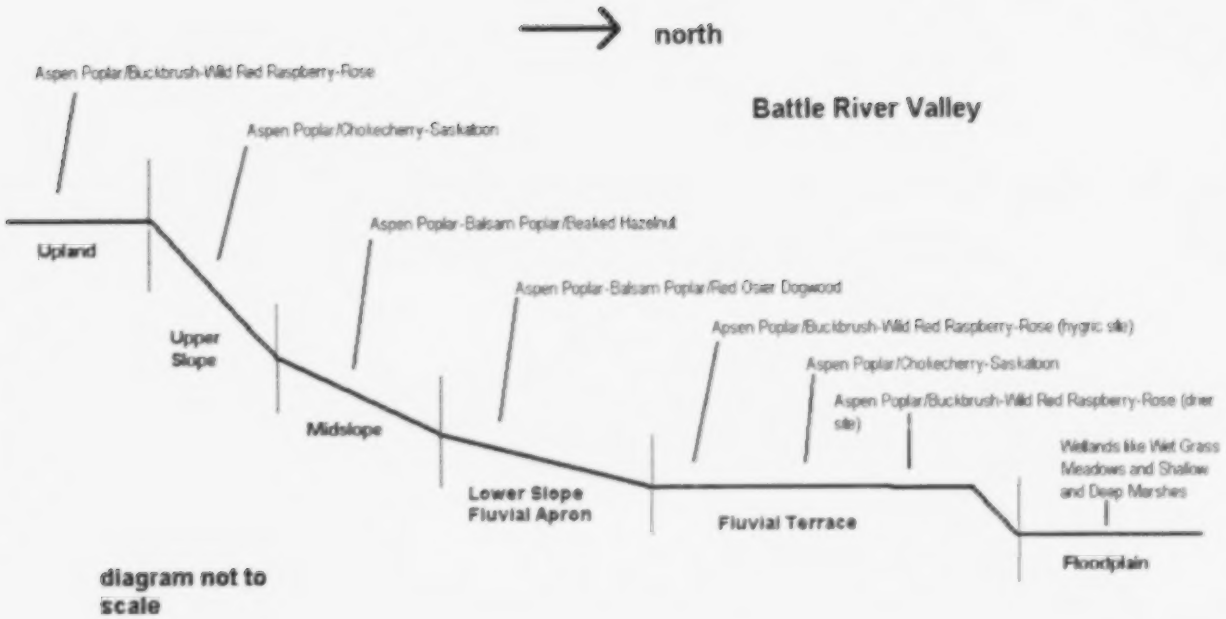


Figure 2. **Schematic diagram of woodland communities along a topographic gradient from the southern uplands, down the broad north facing valley slope onto the Battle River valley floor.**

Table 3. Overview of Big Knife Provincial Park Vegetation Types (Level 2) and Vegetation Communities (Level 3) and associated site and soil conditions
Note: does not include descriptions for Non-vegetated (NV) and Anthropogenic (A) Level 2 types; refer to Section 6.0 for descriptions.

Vegetation Types and Vegetation Communities	Aspect	Drainage Class	Moisture Regime	Nutrient Regime	Soils Subgroup	Parent Material
DRY SITES (NON-WETLANDS):						
Grassland (G) Type	level, S, N, NE, SE, E	very rapid - imperfect	xeric - subhygric	submesotrophic - hypereutrophic	O.BL, O.EB, O.R, O.R (sal.), BL.SS, GL.BL	Ft, Fa, M, Mvb/R
Smooth Brome - disturbed	level	moderately well - imperfect	subhygric	permesotrophic	O.BL, GL.BL	Ft
Sand Grass – Muhly Grass	S	rapid - very rapid	xeric - subxeric	submesotrophic	O.EB, O.R	Mvb/R
Plains Rough Fescue – Kentucky Blue Grass	level,E,S,N,SE	moderately well - well	mesic - subxeric	submesotrophic - hypereutrophic	O.BL, BL.SS, BL.SZ, O.R (sal)	Fa, Ft, M, Mvb/R
Kentucky Blue Grass – Western Wheat Grass	level, N, NE	moderately well	subxeric - submesic	submesotrophic - hypereutrophic	O.R (sal.), BL.SS	Fa
Low Shrubland (LS) Type	level, N,E,S	well - rapid	submesic - subxeric	mesotrophic	O.BL,O.EB,O.DB	Ft, M, Ftv/Fa
Buckbrush	level, E, S	well - rapid	submesic - subxeric	mesotrophic	O.BL,O.EB,O.DB	Ft, M, Ftv/Fa
Buckbrush - Wild Red Raspberry - Rose	N, E, level	well	submesic - subxeric	mesotrophic	O.BL	Ft, M
Tall Shrubland (TS) Type	NE,N,W, S	moderately well - rapid	subxeric - submesic	mesotrophic	O.EB, O.BL	Ft,Gv/M,M, Mvb/R
Silverberry / Buckbrush	NE, W	well - moderately well	submesic	mesotrophic	O.BL	Ft, GFv/M
Silverberry	N, S	rapid - well	subxeric - submesic	mesotrophic	O.BL	GFv/M, M
Chokecherry / Saskatoon	N, W	well	mesic	mesotrophic	O.EB	Ft, Mvb/R
Deciduous Woodland (DW) Type	N, NE, SW, level	rapid - imperfect	submesic - hygric	mesotrophic - hypereutrophic	O.BL,GL.BL, O.EB,GLBL.SO, SZ.BL,CU.R	GFvb/M,M, Mvb/R, Ft, Ff, Fa
Aspen / Buckbrush - Wild Red Raspberry - Rose	level, N	well	submesic - mesic	mesotrophic	O.BL	GFvb/M, Ft
Aspen / Buckbrush – Wild Red Raspberry - Rose - hygric	N, E	imperfect	hygric	permesotrophic - hyper	GL.BL, GLBL.SO	Ft, Fa
Aspen / Chokecherry - Saskatoon	N, E, SW	well	mesic	mesotrophic	O.BL ,CU.R	Ft,Ff, GFv/M
Aspen - Balsam Poplar (White Spruce-Black Spruce) / Beaked Hazelnut	N, NE	rapid - moderately well	mesic to subhygric	mesotrophic - permeso.	O.EB, SZ.BL	M, Mvb/R
Aspen - Balsam Poplar / Red-osier Dogwood	N, NE	well - moderately well	subhygric	permesotrophic	CU.R & SZ.BL	Fa
Mixed Woodland (MW) Type	NE, NW	well - moderately well	mesic - subhygric	mesotrophic	O.EB, CU.R	Fav/M, Cv/M
White Spruce - Aspen Poplar (Balsam Poplar) / Rose	NE, NW	well - moderately well	mesic - subhygric	mesotrophic	O.EB, CU.R	Fav/M, Cv/M
Coniferous Woodland (CW) Type	N, W	rapid - well	subxeric - mesic	mesotrophic - submeso.	O.EB,O.R,BL.SS	Fa, Fo
White Spruce / Rose	N, W	rapid - well	subxeric - mesic	mesotrophic - submeso.	O.EB,O.R,BL.SS	Fa, Fo
WETLANDS:						
Wet Tall Shrubland (TSW) Type	S, SW, NE, level	poor - well	subhygric - subhydric	eutrophic	R.G,O.HG,CU.R, O.G	Fo, Fa
(White Spruce) Willow - River Alder- Red-osier Dogwood	S, SW, NE, level	poor - well	subhygric - subhydric	eutrophic	R.G,O.HG,CU.R, O.G	Fo, Fa
Wet Meadow (WM) Type	level, NE	imperfect - very poor	hygric - hydric	eutrophic - hypereutrophic	R.G, GLBL.SO	Fo, Lv/Ft, Mvb/R
Wet Grass Meadow: Redtop - Sloughgrass - Foxtail Barley - Marsh Reed Grass	level	imperfect - very poor	hygric - hydric	eutrophic - hypereutrophic	R.G, GLBL.SO	Fo, Lv/Ft
Wet Sedge Meadow - Spring: Water Sedge – Awned Sedge	N	very poor	hydric	eutrophic	R.G	Mvb/R
Shallow Marsh (SM) Type	level	poor	subhydric	permeso. - eutrophic	R.G	Lv/Ft
Shallow Marsh – Sedge: Awned Sedge	level	poor	subhydric	permeso. - eutrophic	R.G	Lv/Ft
Shallow Marsh – Sedge & Grass: Awned Sedge - Common Tall Manna Grass	level	poor	subhydric	eutrophic	R.G	Lv/Ft
Deep Marsh (DM) Type	level	very poor	hydric	eutrophic	R.G	Fo
Common Cattail	level	very poor	hydric	eutrophic	R.G	Fo

8. BIG KNIFE PROVINCIAL PARK FAUNA

The large assortment of natural vegetation communities and lack of extensive industrial development in Big Knife Provincial Park provides excellent, undisturbed habitat for a variety of animal species. The Park is part of a continuous band of naturally vegetated riparian landscape that extends along the Battle River valley and its tributaries. Adjacent to these riparian areas are remnants of undisturbed uplands. Most of the habitat for fauna in the uplands outside of the Park has been depleted due to extensive agriculture and other industrial activity such as open pit coal extraction.

The 1998 inventory concentrated primarily on collecting data on site, landforms, soils and vegetation. Incidental wildlife observations were also recorded. The information on the fish and wildlife resources of the Park, which follows, is derived from current literature and personal communication with individuals knowledgeable about the Park's natural history.

8.1 Mammals

Forty species of mammals may potentially inhabit the Park (Macdonald and McIsaac, 1993b). These species are listed in Appendix 3. The following sections provide a general description of common species, which may inhabit the Park. Section 9.0 describes mammal species, which are considered of national, provincial and regional significance.

8.1.1 Ungulates

Three ungulate species inhabit the Park and adjacent Battle River, tributaries and upland areas. These are white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*) and moose (*Alces alces*). Recent ungulate population surveys in Wildlife Management Unit 204 which includes the Park show white-tailed deer having the highest populations, mule deer second most and moose with a very small number (Bjorge, 1996; Bjorge, 1999, pers. comm.). According to Stelfox and Stelfox (1993), white-tailed deer prefer habitat consisting of native woodland and shrub cover (typical in the Park) adjacent to agricultural land (evident in the uplands outside the Park). Such a diversity of habitat enables white-tailed deer to hide in the woodlands and shrublands during the day and emerge into the open areas to forage during the evenings. Mule deer are more suited to open terrain. Their preference is undulating to rolling terrain with open and shrub covered areas, exposed badlands and nearby conifer stands (Stelfox and Stelfox, 1993; Christiansen, 1977). White-tailed and mule deer are classed as "mixed feeders" and have a variable diet consisting of grasses, forbs and woody plants (Stelfox and Stelfox, 1993). Since the early 1980's, moose populations have been experiencing a slow but steady increase in the south central portion of Wildlife Management Unit 204 (Bjorge, 1996). The latest density of moose recorded in WMU 204 was .09 moose/km^2 in 1994. Key factors have encouraged increase of moose in the area. The most noteable are suitable food and cover, lack of predators (other than coyotes), reduced hunting pressure, moose invading into the Parkland due to crowding in adjacent Boreal regions and less illegal hunting (Bjorge. 1996). Moose prefer habitat consisting of mixedwood forest for forage and escape

cover, and mature coniferous tree cover which provides cool relief during hot summer days and themal cover during the winter (Stelfox and Stelfox, 1993). A major component of the vegetation cover in the Park consists of favorable moose habitat. Moose are considered "browsers" preferring the leaves and stems of shrubs and trees.

Elk (*Cervus elaphus*) at one time may have inhabited the Park. Ebel et al (1973) reported that a Park officer observed a female elk during the winter of 1972 -73. Since that period no other sitings of elk have been made, and it is unlikely that elk are found in the Park at present.

8.1.2 Carnivores

Abundant native vegetation cover ranging from woodlands to shrublands to open grassland is suitable habitat for a number of carnivorous mammals (belonging to the Order Carnivora) not only in the Park but the upstream and downstream portions of the Battle River. Undisturbed, naturally vegetated portions of the Battle River and tributaries are frequently used as travel corridors.

The most common carnivore species reported in the Park and adjacent Battle River valley (Macdonald and McIsaac, 1993b) are the coyote (*Canis latrans*) and striped skunk (*Mephitis mephitis).* Coyotes easily adapt to disturbed areas such as agricutural fields, but prefer to be in close contact to wooded areas when travelling. Skunks inhabit a wide variety of cover types ranging from closed forests to open grasslands and agricultural fields. Less common carnivores are the red fox (*Vulpes vulpes*), badger (*Taxidea taxus*), ermine (*Mustela erminea*), least weasel (*Mustela nivalis*), long-tailed weasel (*Mustela frenata*) and mink (*Mustela vison*). Red fox prefer similar habitat to coyotes. Badgers, ermine and weasels like the skunk inhabitat a wide variety of cover types. Mink requires water in its habitat for survival. This species forages for fish, mice, muskrats and molluscs around the perimeter of streams and open water bodies. Lynx (*Felix lynx)* and black bear (*Ursus americanus*) on rare occasions wander through the Park.

8.1.3 Other Mammals

Other mammalian species recorded in the Park are those that occupy the lower end of the food chain and are considered critical to maintaining healthy populations of carnivorous mammals and birds of prey. These include the shrew, rabbit and hares, and rodent orders. The most common species in this grouping recorded in the Park (Macdonald and McIsaac, 1993b) are the:

- red squirrel (*Tamiasciurus hudsonicus*),
- least chipmunk (*Tamias minimus*),
- northern pocket gopher (*Thomomys talpoides*),
- beaver (*Castor canadensis*),
- muskrat (*Ondata zibethicus*),
- snowshoe hare (*Lepus americanus*),

- Richardson's ground squirrel (*Spermophilus richardsonii*),
- Franklin's ground squirrel (*Spermophilus franklinii*),
- deer mouse (*Peromyscus maniculatus*),
- meadow vole (*Microtus pennsylvanicus*),
- southern red-backed vole (*Clethrionomys gapperi*),
- prairie shrew (*Sorex haydeni*),
- dusky shrew (*Sorex monticolus*),
- masked shrew (*Sorex cinereus*),
- little brown bat (*Myotis lucifugus*).

Less common species recorded in the Park are the:

- thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*),
- white-tailed jack rabbit (*Lepus townsendii*),
- porcupine (*Erethizon dorsatum*),
- meadow jumping mouse (*Zapus hudsonius*),
- western jumping mouse (*Zapus princeps*),
- prairie vole (*Microtus ochrogaster*),
- water shrew (*Sorex palustris*),
- Arctic shrew (*Sorex arcticus*),
- silver-haired bat (*Lasionycteris noctivagans*),
- big brown bat (*Eptesicus fuscus*),
- hoary bat (*Lasiurus cinereus*).

Habitat preferences for these species vary widely. Muskrats prefer streams and open water with stable levels and extensive emergent such as that found along both shores of the Battle River north of the Park. Typical beaver habitat is slow flowing streams that run through young to mature deciduous woodlands. Beavers prefer tree cover to be within 200 meters of the streams and water bodies they occupy. Old beaver dams are evident in Big Knife Creek particularly those sections of the creek, which run through deciduous woodlands. Snowshoe hares and porcupine prefer woodlands and fringes around woodlands. Both species rely on woody vegetation as part of their diet. Hares will nibble on tender young shrubs near the ground while porcupines frequently climb trees to feed on bark. The red squirrel is a noisy inhabitant of mixed and coniferous woodlands. The smaller ground squirrels, voles, mice and chipmunks are found in a variety of habitats in the Park. Bats are primarily insect eaters and prefer areas with large expanses of water (such as the Battle River and Big Knife Creek) over which winged insects congregate in great numbers. During the day, bats roost in wooded areas in large tree cavities or on buildings. In 1974, a colony of bats (species unknown) roosting in a tree was noted in the Park (Schowalter, 1974). The significance of this siting was that it was considered the only known tree colony of bats in the province. Since then no observations have been made confirming the continued existence of this colony.

8.2 Birds

215 bird species have been recorded in Big Knife Provincial Park and are listed in a checklist prepared by Macdonald and McIsaac (1993a). These species (refer to Appendix 4) consist of birds who raise young in the Park during the summer, and seasonal migrants who use the Park as a stop-over area in their travels to and from northern breeding grounds. The checklist provides additional information on the status of each species, abundance, habitat preferences and whether they breed in the Park or not. Section 9.0 describes bird species, which are classified as nationally, provincially or regionally significant.

8.3 Amphibians and Reptiles

Five species of amphibians and one reptile have been recorded for the Park (Macdonald and McIsaac, 1993b; Petry, 1998). The amphibians are the tiger salamander (*Ambystoma tigrinum*), Canadian toad (*Bufo hemiophrys*), boreal chorus frog (*Pseudacris triseriata maculata*), wood frog (*Rana sylvatica*) and northern leopard frog (*Rana pipiens*). The sole reptile species listed is the western plains garter snake (*Thamnophis radix haydeni*). The five amphibians and one reptile require open water of some form (e.g. ponds, lakes, streams, springs) as part of their habitat. Open water bodies contain food such as aquatic insects and their larvae, fish, and molluscs. The amphibians also require open water to lay eggs in, and for their aquatic larval stage.

Tiger salamanders, boreal chorus frogs, and wood frogs according to relatively recent studies (Roberts, 1992), appear to have healthy populations throughout the Central Region of Alberta. Northern leopard frogs (Roberts, 1992; Wagner, 1997) and Canadian toads (Hamilton et al., 1998) on the other hand have experienced severe population declines and the western plains garter snake may be experiencing some risk. The current status of the northern leopard frog, Canadian toad and plains garter snake are discussed in Section 9 - Significant Features.

8.4 Fish

Seventeen species of fish have been recorded by Macdonald and McIsaac (1993b) for open water areas associated with the Park, namely the Battle River and Big Knife Creek. The Battle River flows along the north boundary of the Park, and is considered warm water habitat for fish, similar to other streams and lakes in the Central Parkland subregion (Christiansen, 1977). Also like most other streams in the region, the Battle River is slow flowing with a silt and sand bottom. The section of the river north of the Park is further influenced by Forestburg Reservoir, which it grades into west of the Secondary Highway 855 bridge. The Reservoir impounded behind a weir near the Alberta Power thermal electric power plant located approximately 5.8 km south-east of the Park has reduced flow rates and increased average water temperatures in this stretch of the river. This creates an aquatic environment favorable for maintaining large populations of white sucker (*Catostamus commersoni*) and northern pike (*Esox lucius*) which are the two most abundant major fish species in the Battle River system. White suckers are able to tolerate a wide

range of aquatic environmental conditions including low oxygen levels. Suckers are omnivorous, bottom-feeders whose diet consists of insect larvae, snails, small clams and algae. Northern pike prefer stretches of the Battle River with abundant submergent and emergent vegetation. Pike prefer to spawn in areas of vegetation that are flooded during the spring to depths less than 50 cm. Pike like suckers can also withstand low oxygen levels. Pike are primarily piscivorous or fish-eaters, and occasionally will consume aquatic invertebrates. White suckers and northern pike are also likely to inhabit the lower stretch of Big Knife Creek above its confluence with the Battle River. Here water levels in the mouth of the Creek are high enough due to the water back up in the Battle River. Upper portions of Big Knife Creek become intermittent by mid-summer and are unlikely to support major fish species.

Other major fish species observed in the Reservoir (Buchwald, 1999) and upstream stretches of the Battle River are the occasional walleye (*Stizostedion vitreum*) and yellow perch (*Perca flavescens*).

Common forage fish species (food sources for predatory fish, birds and mammals) in the Battle River and lower Big Knife Creek (Christiansen, 1977), are the longnose dace (*Rhinicythys cataractae*), lake chub (*Couesius plumbeus*), fathead minnow (*Pimephales promelas*), emerald shiner (*Notropis alherinoides*), spottail shiner (*Nortopis hudsonius*), trout-perch (*Percopsis omiscomaycus*), brook stickleback (*Culaea inconstans*) and iowa darter (*Etheostoma exile*). Fathead minnows and brook sticklebacks are most suited to highly turbid waters with low oxygen levels typical of most of the Battle River and tributaries such as Big Knife Creek. The diet of these fish species consists of insect larvae, zooplankton and algae.

9. SIGNIFICANT FEATURES

Significant or special features are attributes (habitats, landforms, vegetation communities, historical sites) or species in the Park that are are assessed as endangered, threatened, rare, limited, disjunct, or relict populations or individual occurrences at the international, national and provincial levels (Sweetgrass Consultants Ltd., 1997). These levels are defined by Sweetgrass Consultants Ltd. (1997) as follows:

International - features which are unique in the world

National - features which are limited in distribution at a national level or which are the best and only representatives in Canada. These may include staging habitats, which attract high populations of waterfowl and shorebirds, national parks, endangered species habitats and occurrences of nationally rare plant and animal species.

Provincial - features which are of limited distribution in Alberta or are the best examples of a particular feature in Alberta. Areas designated as provincially significant include sizable remnants of relatively undisturbed upland and valley

habitats, important waterfowl and shorebird production and staging habitats and critical wildlife ranges for a variety of mammals (e.g. deer, pronghorn antelope, caribou, moose, grizzly bear) in the province.

Regional features are less formally defined. For the purposes of this report, landscape features are considered regionally significant if they meet the following criteria:

- may occur in other Natural Regions of the province but are considered uncommon or rare in the Central Parkland Subregion,
- represent a good natural example of a feature that at one time was common in the region prior to human activity,
- represent an excellent or "classic" landscape feature,
- identify areas sensitive to disturbance,
- man-made features which enhance biological diversity, and wildlife habitat.

The features listed in the sections that follow are based solely on currently available information and data collected in the field in 1998, and should be considered incomplete. Descriptions of significant biological features only include plant and vertebrate animal species. Invertebrates have been excluded due to the lack of exisiting information and the fact these were not part of the current study. In the future as more information becomes available, many more species may be added to the list of known organisms.

Locations of provincially and regionally specific significant features are displayed on Map 4 in the back of the report.

9.1 Nationally Significant Features

Big Knife Provincial Park lies within the eastern portion of a stretch of the Battle River valley termed "Battle River - Bigknife" which is rated as nationally significant (Sweetgrass Consultants Ltd., 1997). The Park is part of an interprovincial waterway, namely the Battle River. This portion of the Battle River valley represents "one of the most intact and diverse valley complexes in the Parkland Region of Canada" (Sweetgrass Consultants Ltd., 1997) consisting of extensive areas of uncultivated valley bottom along a meandering stream. This type of valley landscape is considered rare in the Parkland Region of Canada.

The Park also includes critical habitat suited to a number of bird species and one amphibian on Alberta's Watchable Wildlife Checklist Series for the Park (Macdonald and McIsaac, 1993a; Macdonald and McIsaac, 1993b), which are classed as threatened or vulnerable by the Committee on the Status of Endangered Wild in Canada (COSEWIC, 1998). These critical habitats for the purposes of this report are considered nationally significant. These four species are the loggerhead shrike (threatened), ferruginous hawk (vulnerable), short-eared owl (vulnerable) and northern leopard frog (vulnerable). Threatened species are defined as those which are likely to become endangered if limiting

factors are not reversed, while vulnerable species are of special concern because of characteristics which make them especially sensitive to human or natural disturbances.

9.1.1 Loggerhead Shrike (COSEWIC threatened)

Reduction in populations of loggerhead shrikes is a result of the loss of winter and breeding habitat and the reduced diversity and availibility of prey such as large insects, mice and an occasional small songbird due to poisoning by fertilizers and insecticides. The preferred habitat of loggerhead shrikes is open grasslands for hunting prey and shrub thickets for perching and nesting. The Status of Alberta wildlife places this shrike species on their Yellow A List which signifies species "for which there has been concern expressed over long term declines in their numbers" (Alberta Environmental Protection, 1996). Populations are considered low and poorly understood and declines have been observed in the past number of years. The Park provides undisturbed remnants of suitable habitat.

9.1.2 Ferruginous Hawk (COSEWIC vulnerable)

Ferruginous hawks are found primarily in the Grassland Natural Region in moderately cultivated areas, and large expanses of natural grasslands with abundant prey primarily ground squirrels and occasional hares, voles, mice and birds (Semenchuk, 1992). These hawks occasionally nest outside their preferred range. Semenchuk (1992) notes one confirmed nest site north of the Battle River in the Parkland Region. The expansion of agriculture and the encroachment of shrublands and woodlands into grasslands in the Parkland have reduced this hawk's preferred habitat, and as a result numbers are disappearing. It is unlikely that the Park contains enough open grassland with large enough populations of prey to sustain a breeding pair of hawks.

9.1.3 Short-eared Owl (COSEWIC vulnerable)

The preferred breeding habitat for this species of owls is grasslands, grassy or bushy meadows, marshy areas, pastures, cultivated land and cleared areas that were former forests. These owls breed primarily in the Grassland and Parkland Regions (Semenchuk, 1992) and prefer sites which provide the necessary cover and hunting territory. The Status of Alberta Wildlife places the short-eared owl on its Blue List which suggests that this species may be at risk in this province due to non-cyclic declines in numbers and disappearance of suitable habitat (Alberta Environmental Protection, 1996). The Audobon Society's Blue List indicates declines in owl population from 1976 to 1986 (Semenchuk, 1992).

9.1.4 Northern Leopard Frog (COSEWIC vulnerable)

The northern leopard frog is experiencing severe declines in population which were first noticed in 1978 (Russell and Bauer, 1993). Once common throughout the province, northern leopard frogs are now found only in the Grassland and Parkland Natural Regions.

These frogs inhabit springs, streams, marshes and other permanent water bodies with abundant aquatic vegetation (Russell and Bauer, 1993). The frog's diet consists of insects, spiders, other small invertebrates and the occasional small birds, garter snakes, tadpoles, mature frogs and small fish. The species overwinter by hibernating in the mud at the base of standing water and under rocks in streams and springs. According to Russell and Bauer (1993) possible causes of population declines are herbicide and pesticide pollution, several consecutive drought years drying up breeding sites, and mortality of adults during winter hibernation. The Status of Alberta Wildlife (Alberta Environmental Protection, 1996) places the northern leopard frog on the Red List, which indicates that these species are at risk due to populations declining to nonviable levels. This frog species was given protection as an "endangered" species under the provincial Wildlife Act in 1997. According to Wagner (1997), this frog species appears to be extirpated over most of central Alberta. However, a very recent new siting of a northern leopard frog was received for a location near Wainwright (Takats, 1999). It is too early to tell from this one siting if this frog is making a comeback. It appears that the northern leopard frog currently does not exist in the Park since there are no recent records confirming its presence.

9.2 Provincially Significant Features

Provincially significant features include fauna, flora and floral assemblages that are experiencing threats to their viability as a result of the loss of critical habitat. Many of the provincially significant features are faunal species. These species described below are notable (Alberta Environmental Protection, 1997) because they rely heavily on the Parkland Natural Region to provide their habitat requirements (e.g. bird nesting habitat, waterfowl staging areas). These species are indicated on the Red, Blue and Yellow Lists compiled by Alberta Environmental Protection (1996) in its most recent status of Alberta wildlife report. Red Listed species are those that are at immediate risk due to declines in population or perceived declines to non-viable levels. Blue Listed species may be at risk and include those that are vulnerable due to non-cyclical declines in numbers or habitat, or reductions in provincial distribution. Species on the Yellow List are not currently believed to be at risk but likely require special management to remedy naturally low populations. Yellow Listed faunal species have limited distribution across the province or have characteristics, which make them susceptible to changes in the environment caused by human activity. The Yellow List is further subdivided into A and B classes. Yellow A List species have shown long-term declines in numbers, and as a result must be closely monitored. Yellow B List species are 1) naturally rare but not in decline, 2) naturally rare with clustered breeding populations or 3) those associated with habitats and habitat elements that are disappearing or deteriorating such as old-growth forests and significant wildlife habitat trees. Yellow B listed species may require management to ensure that they are not put at further risk.

Provinically significant flora and floral assemblages have been identified for the Park based on the 1999 rankings provided by the Alberta Natural Heritage Information Centre (ANHIC, 1999a; ANHIC, 1999b). Primarily, plant species with an S1 or S2 ranking are considered significant, as well as some S3 ranked species. Plant communities of significance are ranked as S1 and S2, along with some designated as S?. These rankings are based on the number of occurrences and the spatial distribution of a particular species or the areal extent of a plant community. The definitions are as follows:

S1 - five or fewer occurrences or only a few remaining individuals or communities,

S2 - six to 20 occurences; or with many individuals in fewer occurrences; or communities with few remaining acres,

S3 - 21 to 100 occurrences; individuals may be rare and local throughout its range or in restricted range; communities may be rare and local thoughout its range or found locally, even abundantly, in a restricted range, and

S? - not yet ranked.

9.2.1 Fauna

Provincially significant fauna for the purposes of this report are those species recorded on the Alberta's Watchable Wildlife Checklists for the Park (Macdonald and McIsaac, 1993a; Macdonald and McIsaac, 1993b), which occur on The Status of Alberta Wildlife Red, Blue and Yellow Lists (Alberta Environmental Protection, 1996). Excluded are those species, which are designated as endangered, threatened or vulnerable by COSEWIC (1998). These species have already been discussed in the previous section (9.1) dealing with Nationally Significant Features.

Provincially significant fauna for Big Knife Provincial Park are described in Table 4 along with their distribution in Alberta, preferred habitat, and concerns regarding their numbers and viability.

Table 4: Provincially Significant Faunal Species Recorded For Big Knife Provincial Park

(sources: Macdonald and McIsaac, 1993a; Macdonald and McIsaac, 1993b; COSEWIC, 1996; Semenchuk (ed.), 1992; Russell and Bauer, 1993; Smith, 1993; Alberta Environmental Protection, 1997)

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Red List - Amphibians	Canadian Toad	Entire Central Parkland Subregion, eastern portion of the Boreal Forest Region and northern half of the Grassland Region	Breeds in shallow portions of lakes, ponds, ditches, marshes and temporary water bodies.	Once common in the Boreal and Parkland Region; now experiencing severe decline in the Parkland.
Blue List - Birds	Sprague's Pipit	Primarily in the Central Parkland Subregion and Grassland Region.	Shrubby grassland, dry lake bottoms, occasional moderately grazed areas and grassy locations on sandhills	Cannot tolerate heavily grazed areas and does not prefer areas of non-native vegetation cover; declines likely the result of habitat loss
	Cape May Warbler	Suitable habitat throughout the Boreal Forest Region with occasional occurrences in the Foothills, Central Parkland Subregion and Grassland Region.	Breeds in dense mature old growth white spruce coniferous forest and mixedwood forest with open areas and edges.	Population undetermined in Alberta
	Black-throated Green Warbler	Primarily in the Boreal Forest and Foothills Regions with occasional occurrences in the Central Parkland Subregion and Grassland Region.	Mature coniferous and mixedwood with large white spruce stands.	Viable populations dependant on the maintenance of old-growth forest.
	Bay-breasted Warbler	Suitable habitat throughout the Boreal Forest Region with occasional occurrences in the Central Parkland Subregion.	Prefers to breed in mature white spruce stands, mixed coniferous stand and mixedwood stands with clusters of coniferous trees.	Viable populations dependant on the maintenance of old-growth forest.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow A List -Mammals	Richardson's Ground Squirrel	Southern limits of the Boreal Forest Region, entire Central Parkland Subregion and Grassland Region.	Open grasslands, overgrazed pastures, and along ditches, grain fields and hay meadows.	Population declines due to deliberate poisoning and habitat changes; populations are becoming fragmented.
	Thirteen-lined Ground Squirrel	Primarily in the Central Parkland Subregion and the northern, eastern and southern limits of the Grassland Region in the province.	Edges of shrublands where there are dense grasses and forbs such as open hay field and open pastures.	Concern that populations are declining; status is unknown.
	Long-tailed Weasel	Found in southern two-thirds of province from roughly Slave Lake south.	Grasslands, aspen parklands and open coniferous forest	Populations declining due to habitat loss caused by agricultural activity.
	Badger	Southern limits of Boreal Forest, entire Central Parkland Subregion and Grassland Region and Foothills and Rocky Mountains in SW corner of province.	Grasslands and aspen parklands close to populations of prey such as ground squirrels and pocket gophers.	Different opinions on population patterns.
Yellow A List - Birds	Pied-billed Grebe	Found on wetlands throughout Alberta; highest populations are in the southern Boreal Forest Region, eastern Foothills Region and the entire Central Parkland Subregion and Grassland Region.	Wetland or prairie sloughs with dense emergent vegetation along shorelines or islands; occasionally inhabit river backwaters, shallow bays of large lakes, slow moving streams or irrigation ditches.	Recent droughts have dried up wetland and slough habitats, which have reduced populations.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow A List - Birds (continued)	Red-necked Grebe	Common on wetlands throughout the province; highest concentrations in the southern limits of the Boreal Forest Region, eastern limits of the Foothills Region in Central Alberta and entire Central Parkland Subregion.	Small, shallow lakes greater than 2 hectares in area and shallow protected bays of larger lakes.	Common but may be declining in numbers.
	American Bittern	Breeds in suitable habitat throughout the province with highest concentrations recorded in southern Boreal Forest Region and entire Central Parkland Subregion.	Marshes, swamps, wet meadows, wet tall shrublands and occasional dry meadow; sites must have dense cover of emergent vegetation or tall grasses.	Drainage and cultivation of wetlands is reducing preferred habitat, which is causing population declines.
	Northern Harrier	Breeds across the province with greatest concentrations in the southern half of the province excluding the Rocky Mountains.	Requires open landscape such as marshes, meadows and cultivated fields; preferred breeding habitat are moist meadows and occasional drier sites provided there is enough food and nesting cover.	Areas of breeding and hunting habitat are disappearng causing population declines; more studies required to understand population trends.
	Swainson's Hawk	Southern Boreal Forest Region, eastern portion of the Rocky Mountains and Foothills in southern Alberta, and the entire Central Alberta Parkland Subregion and Grassland Region.	Open upland areas with concentrations of trees and shrub for nesting; open areas are used for hunting prey and can include agricultural fields with grassy fringes.	Insecticide poisoning of adults in their winter range in the southern hemisphere (primarily South America) has caused severe reductions in numbers; healthy populations of ground squirrels (an important food source) are required to maintain healthy populations of Swainson's hawks.
	Sharp-tailed Grouse	Southern Boreal Forest Region, entire Parkland Region (including the Peace River Parkland Subregion) and Grassland Region.	Preferred Parkland Region breeding habitat is agricultural land and open woodland.	Habitat is decreasing due to agricultural expansion, which is resulting in declining numbers.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow A List - Birds (continued)	Lesser Yellowlegs	Suitable habitat throughout the province with the greatest concentrations in the southern Boreal Forest Region and northern Central Parkland Subregion.	Open woodlands with interspersed marshes, ponds and lakes; wet areas used for feeding and rearing young; mature birds prefer shallow water along shorelines of larger lakes for foraging	Disappearing wetland habitat is resulting in declining numbers.
	Upland Sandpiper	Primarily the Grassland Region with occasional occurrences in the Parkland Region (including the Peace River Parkland Subregion) and the southern Boreal Forest Region.	Open grasslands on uplands, hay fields, pastures, wet meadows and old agricultural fields with little woody growth; freshly cultivated fields rarely used; most suitable nesting and foraging areas are upland sites.	Loss of native grassland habitat has caused declines in population; this species has very specific habitat requirements and appears not able to adapt to disruptions.
	Black Tern	Found throughout the province in suitable habitat with greatest concentrations in the Southern Boreal Forest Region, entire Central Parkland Subregion and to a lesser degree the Grassland Region.	Shallow marshes, sloughs, ponds and wet meadows all with shallow areas and extensive emergent vegetation; large open expanses of water required by adults prior to nesting and after young have fledged.	Exact caused of apparent population declines unknown; possibly due to habitat loss.
	Brown Thrasher	Entire Grassland Region and occasionally the Central Parkland Subregion.	Shrubs along woodland edges, hedges, shrub thickets and brush along streams, in coulees and fence rows.	Reports of declining numbers; exact numbers unknown.
	Clay-colored Sparrow	Common in suitable habitat throughout Alberta with greatest recorded concentrations in the southern half of the province.	Shrublands, shrubby pastures, meadows with tall shrubs, shrubby open areas in woodlands, shrubby wood edges, thickets along streams, ponds, lakes and wetlands.	Significant population declines; more research required to identify causes.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow A List - Birds (continued)	Western Meadowlark	Primarily the southern Boreal Forest Region, entire Central Parkland Subregion, a portion of the Peace River Parkland Subregion around Peace River, entire Grassland Region, eastern limits of the Foothills and Rocky Mountains Regions.	Grasslands, river valleys, pastures, uncultivated, grassy and weedy ditches along roads.	Significant population declines over last 30 years especially in the Central Parkland Subregion; likely the result of the loss of open grassland habitat.
Yellow A List - Reptiles	Western Plains Garter Snake	Primarily the southern margins of the Boreal Forest Region, entire Central Parkland Subregion and Grassland Natural Region.	Tolerates a wide variety of habitats; frequently found hunting for prey (fish, amphibians, small mammals, worms, insects, dead flesh) along ponds, lakes, streams, marshes and dugouts.	Perceived population declines; suggestion to preserve key habitats such as winter hibernacula.
Yellow B List - Mammals	Canada Lynx	Entire Boreal Forest, Canadian Shield, Foothills and Rocky Mountain Natural Regions and the western limits of the Central Parkland Subregion, entries into the Central Parkland Region are likely along wooded river valleys.	Coniferous and mixedwood forest.	Populations are cyclic based on the abundance and availibility of prey; recent decreases in numbers likely due to loss of forest habitat.
Yellow B List - Birds	Western Grebe	Primarily the southern limits of the Boreal Forest Region and entire Central Parkland Subregion and Grassland Region.	Medium to large lakes with stands of dense emergent vegetation around the perimeter and deep open water with large fish populations for food.	On Yellow B list because the species is local and uncommon in the Province.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List - Birds (continued)	American White Pelican	In suitable habitat in Natural Regions located in the eastern half of the province.	Shallow, murky lake relatively unaffected by human activity with shallow water near shore and large populations of fish for food; occasionally colonize deep, clear lakes and rivers; preferred nesting habitat are treeless, low islands protected from waves and land mammal predators.	Increasing population but decreasing number of colonies; initially an endangered species with number of nesting pairs increasing in certain areas, however other colonies may be declining due to disease and drought.
	Double-breasted Cormorant	Primarily the southern Boreal Forest Region, northern and western portion of the Central Parkland Subregion and the southern three quarters of the Grassland Region.	Breeds on large lakes and reservoirs containing large fish populations and protected, low-lying islands for nesting colonies.	Formerly endangered in 1977; now no longer considered endangered; populations increasing; suggest continued protection of colonies.
	Great Blue Heron	Primarily the southern Boreal Forest Region, Foothills Region south of the Athabasca River, eastern limits of the Rocky Mountains Region in southwest Alberta, and the entire Central Parkland Subregion and Grassland Region.	Shallow open water at edges of lakes, ponds, streams, rivers, sloughs, ditches, marshes, and mudflats; preferred nesting habitat are trees and shrubs on lake islands and shorelines and along creeks and rivers.	Stable population distributed over fewer than 100 recorded nesting colonies; management and protection of key habitats required to maintain healthy populations.
	Black-Crowned Night Heron	Central Parkland Subregion and Grassland Region.	Large water bodies with dense emergent vegetation such as marshy lakes and ponds and man-made reservoirs in irrigated farmland; nests in colonies.	Increase in population over the last 20 years; special management required to maintain wetland habitat.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List - Birds (continued)	Turkey Vulture	Very localized along the lower North Saskatchewan River and lower Battle River valley the Central Parkland Subregion; central to lower portion of the Red Deer River valley, lower Saskatchewan River valley, Milk River valley in the Grassland Region and Cypress Hills.	Trees for roosting near a reliable food source and water are the preferred foraging habitat; nesting habitat includes rocky outcrops, caves and crevices in cliffs and scraped area beneath a log in mixedwood forest.	Very localized breeding areas in and along river valleys; speculation that there are probably less than 100 breeding pairs; population trend unknown.
	Osprey	Suitable habitat throughout Alberta except the drier Grassland Region.	Near permanent lakes and rivers with good populations of fish for food; suitable nesting sites are tree tops, cliffs or man-made structures such as poles near water.	Populations unknown, however, there is a perceived decline in numbers; suggest protection of nesting sites.
	Bald Eagle	Suitable habitat throughout the province with lowest concentrations in the Central Parkland Subregion and Grassland Region.	Near large permanent lakes and rivers with good fish populations and little human disturbance; breeding sites are tall trees near open water which are used for nests and roosts.	Once at risk throughout North America and Alberta now recovering; nests susceptible to human disturbance.
	Cooper's Hawk	Southern half of the province with highest concentrations in the southern edge of the Boreal Forest Region and Central Parkland Subregion.	Dense interiors of deciduous and coniferous woodlands often near water.	Clearing of aspen woodland in Parkland reduces preferred nesting habitat, which may cause population declines.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List - Birds (continued)	Northern Goshawk	Suitable habitat throughout the province with the greatest concentration recorded for the southern edge of the Boreal Forest Region, and the Foothills Region Rocky Mountain Regions and west half of the Central Parkland Subregion.	All forest habitats primarily dense mixedwood stands interspersed with openings.	Unknown populations; suggest maintaining mature forests for breeding habitat.
	Broad-winged Hawk	Primarily the southern limits of the Boreal Forest Region and the northern portion of the Central Parkland Subregion.	Dense, mature to old-growth forests with open areas or near clearings or wetlands; dense forest is used for nesting and edge of clearings for hunting	Population declines observed in Parkland Region especially around urban areas; suggest preservation of forest stands as suitable habitat.
	Golden Eagle	Rocky Mountain Region and along the lower reaches of major rivers such as the South Saskatchewan and Red Deer Rivers in the Grassland Natural Region; over other parts of the province this eagle in considered transient.	Suitable habitat in the Central Parkland Subregion and Grassland Natural Regions would be open grassland with coulees, steep river banks and canyons; nesting sites are high isolated ledges on cliffs, escarpments and rocky bluffs.	Low populations spread out over a large area; breeding pairs estimated between 100 to 250; suggest protection of nesting sites to maintain a viable population.
	Ring-necked Pheasant	Extreme southern edge of the Boreal Forest, entire Parkland Region (including Peace River Parkland Subregion) and Grassland Region.	Farmland and grasslands with adjacent cover such as reedbeds, hedges, willow shrub or woodland; often in dense cover along irrigation canals.	Species introduced from Eurasia in 1908; populations have decreased significantly since introduction; likely the result of high mortality during severe winters and habitat loss.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List - Birds (continued)	Sandhill Crane	Suitable habitat throughout the Boreal Forest Region, Canadian Shield and Foothhills Region and less common in the Central Parkland Subregion and no longer in the Grassland Region.	Secluded marshes, bogs near ponds, large marshes with open water and tall emergent grasses and rushes.	Sparse distribution in the Boreal and Foothills Regions; easily disturbed by man's activities; Parkland Region is used mainly as stopover area during spring and fall migrations.
	American Avocet	Extreme southern edge of the Boreal Forest Region and the entire Central Parkland and Foothills Parkland Subregions and entire Grassland Region.	Shallow waters and mudflats around alkaline and saline lakes and sloughs, and marshes with sparse vegetation and broad wet meadows with open ponds are preferred foraging habitat; preferred breeding and nesting habitat are dried out mudflats and low, gravelly to sandy islands.	Currently abundant in the Parkland and Grassland Regions, however, loss of habitat to degradation and drought may cause population declines.
	Willet	Entire Central Parkland and Foothills Parkland Subregions and the entire Grassland Subregion.	Moist and wet meadows, grass covered edges of sloughs and lakes and the occasional weedy pond or shallow creek; preferred nesting sites are beaches and dry grassy areas near wetlands.	Suggestions of decline; current populations unknown; habitat loss due to drought and wetland drainage.
	Herring Gull	Primarily the Canadian Shield; eastern portion of the Boreal Forest Region and the extreme northeast corner of the Central Parkland Subregion.	Breeding sites are around large permanent lakes and rivers; foraging habitat consists of lakes, ponds, open areas, cultivated land and garbage dumps; prefer to nest on islands, rocky peninsulas and boulders in large lakes.	Population probably stable; this species breeds in the northern part of the province; this species likely stops over in the Central Parkland during spring and fall migration.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List - Birds (continued)	Great Gray Owl	Primarily the Boreal Forest and Foothills Regions.	Breeds primarily in the coniferous, deciduous and mixed woodlands near bogs, marshes and wet meadows in the Boreal Forest; hunting territory consists of forest margins in shrubby clearings and forest open areas.	Unknown populations; breeds primarily in the foothills and boreal forest; rare recordings of this owl likely migrants; at one time listed as vulnerable by COSEWIC, however, it has been removed from the vulnerable list in the latest COSEWIC (1998) report.
	Black-backed Woodpecker	Occurrences have been recorded for the Foothills Region around the upper Athabasca and Pembina River valleys and the Swan Hills in the Foothills Region.	Dense coniferous or mixed wood forest with numerous standing trees for building nesting cavities.	Rare sitings in the Parkland Region are likely transient birds.
	Brown Creeper	Suitable habitat is scattered throughout the Rocky Mountains, Foothills, southern edge of the Boreal Forest, western edge of the Central Parkland Subregion and the Foothills Parkland Subregion in the southern half of the province.	Mature coniferous or mixedwood forest.	Populations not well documented; probably fewer than 5000 pairs in the province; suggest preservation of mature woodland habitats.
	Marsh Wren	Southern limits of the Boreal Forest Region, the entire Central Parkland Subregion, western and southern portions of the Grassland Regions and Peace River Parkland Subregion around Fort Vermilion.	Marshes vegetated with cattails and bulrushes.	Unknown populations; breeding area habitat lost due to wetland drainage and drought.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List - Birds (continued)	Black-and-White Warbler	Throughout the Boreal Forest Region, local areas in the Foothills and to a lesser extent in the western portion of the Central Parkland Subregion.	Moist deciduous and mixed wood stands near water and thick alder and willow near bogs and ponds in the Boreal Forest and more treed areas of the Parkland.	Uncommon throughout most the province; general declines in existing populations throughout North America.
	Mourning Warbler	Central portion of the province concentrated in the southern and eastern portion of the Boreal Forest Region, northern portion of the Central Parkland Subregion and the Foothills Region including the area between the North Saskatchewan and Athabasca River water sheds and the Swan Hills.	Partially open canopy mature to old-growth deciduous woodland with dense tall shrubs in the understory.	Unknown populations; generally uncommon in Alberta.
	Western Tanager	Common throughout the entire province except the Grassland Region; largest concentrations recorded for the southern Boreal Forest and Foothills Regions, northern limit of the Central Parkland Subregion and to a lesser extent the northern portion of the Boreal Forest and the Rocky Mountains.	Open coniferous and mixed wood forest in the Boreal and Montane areas.	Unknown populations; declines observed in other areas of range outside of the province.
	Lark Sparrow	Entire Grassland Region and the southern limits of the Central Parkland Subregion.	Semi-open sites in river valleys and coulees, and sandhills; occasionally inhabits well grazed pastures, abandoned fields and urban areas with trees and shrubs.	Uncommon in the province; local distribution.

STATUS OF ALBERTA WILDLIFE (1996) RANKING & FAUNAL GROUPING	SPECIES	DISTRIBUTION IN ALBERTA	HABITAT PREFERENCE	COMMENTS REGARDING SPECIES VIABILITY, DISTRIBUTION AND POPULATIONS
Yellow B List – Birds (continued)	Bobolink	Locally restricted to northern and eastern edge of the Central Parkland Region and extreme south-west portion of the Boreal Forest Region; also has been reported in the south-west and east central portion of the Grassland Region.	Open meadows and pasture lands containing moist sites with tall grass and hayfields; does not prefer native grasslands.	Very local distribution; likely less than 500 breeding pairs in the province.

9.2.2 Flora

No plant species of concern according to the 1999 ANHIC tracking list were encountered at the field sample sites during the 1998 field season. However, rare plant species may exist elsewhere in the Park. This biophysical inventory did not include a rare plant survey.

9.2.3 Floral Assemblages

The *Festuca hallii* alliance has not yet been ranked in Alberta. In Saskatchewan this alliance is ranked as S2 while in Manitoba it is designated as S1 (Alberta Natural Heritage Information Centre, 1999b). Throughout much of its native range in Alberta, communities with a major component of plains rough fescue have been eliminated as a result of extensive cultivation. Areas of plains rough fescue still remain in Big Knife Provincial Park. This species of fescue is found primarily on the uplands, on undisturbed fluvial aprons and on fluvial terraces adjacent to the Battle River (refer to Map 4). Plains rough fescue is a dominant graminoid component in terms of its cover in the Plains Rough Fescue - Kentucky Bluegrass grassland community (represented by Sites 15, 23a, 47, 53, 57, 59, 67, and 68), and two low shrubland communities, namely Buckbrush (Sites 6, 23c, 29, 30, 33, 37 and 66) and Buckbrush - Wild Red Raspberry - Rose at Site 54. Within the grassland community plains rough fescue is often co-dominant with Kentucky bluegrass. Weerstra and Weestra (1998) did not identify a plains rough fescue - Kentucky bluegrass community type in their preliminary classification. Their classification is based on identifying grassland sites where the tree and shrub cover is generally less than 25%. The low shrubland communities identified as part of this study therefore would not be recognized as possible fescue community types according to Weestra and Weerstra (1998). The buckbrush communities often tend to occur on the periphery of grassland areas and in some areas appear to be invading into the grasslands in the Park. Perhaps the preliminary classification prepared by Weerstra and Weerstra (1998) could be broadened to include a wider range of native communities where plains rough fescue is a major component.

9.3 Regionally Significant Features

A number of landform features, wildlife habitats and vegetation communities evident in the Park do not have national or provincial significance, but are considered significant in a regional sense. As stated earlier in this section, regional features in this report:

- may occur in other Natural Regions of the province but are considered uncommon or rare in the Central Parkland Subregion,
- represent a good natural example of a feature that at one time was common in the region prior to human activity,
- represent an excellent or "classic" landscape feature,
- identify areas sensitive to disturbance.
- man-made features which enhance biological diversity, and wildlife habitat.

The following features (some of which are identified on Map 4 in the back of the report) have been derived from existing published information, anecdotal accounts and observations made during the 1998 field season.

1. Exposures of Upper Cretaceous Horseshoe Canyon and Bearpaw formation sedimentary bedrock in the form of mini badlands and small hoodoos are evident in the southern portion of the Park. An old Alberta Provincial Parks Master Plan Programme Objectives and Methodology publication (year unknown) prepared by the former Parks Planning Branch, Department of Lands and Forests indicates the presence of partially pertrified burned wood in bedrock exposures on the the butte remnants along the western boundary of the Park. Map 4 depicts exposures of sedimentary bedrock derived by identifying all non-vegetated (NV) Level 2 types within the Level 1 exposed slope (Vx) class.

2. Diverse vegetation communities ranging from open grasslands to dense mature woodlands to deep marshes which provide relatively undisturbed habitat to numerous wildlife species are evident throughout the Park.

3. Two springs occur discharging from mid-slope positions on the north-facing Battle River valley slope. Moisture and nutrients from these springs have created a lush wet meadow downslope and increased understory species in adjacent woodland communities. Map 4 shows the location of the two springs.

4. Stands of old growth, tall white spruce grow the on Big Knife Creek floodplain and the lower north facing valley slopes. Map 4 shows the location of these mature white spruce communities, which were derived by identifying all the coniferous woodland (CW) dominant Level 2 vegetation types.

5. Prime white-tailed deer overwintering habitat was observed by Bjorge (pers comm, 1999) in the Battle River valley bottom and on the north-facing slopes in the western portion of the Park.

6. Prime mule deer habitat is likely in the vicinity of the badlands. Mule deer co-exist with white-tailed deer.

7. The Park contains habitat suited to regionally rare bird species such as the purple finch. The purple finch prefers coniferous woodlands for nesting and deciduous woodlands for feeding. Woodlands of this type are typical in the Park and less common in the rest of the Parkland Region.

8. The western portion of the Forestburg Reservoir and the Reservoir's influence on the Battle River further upstream along the north end of the Park has created spawning, overwintering and rearing habitat aquatic habitat suited to maintaining large populations of common sucker and northern pike. These large populations of fish along with smaller forage fish species such as longnose dace and fathead minnows are an important food source for birds such as white pelicans and bald eagles.

10. LEVEL 1 AND LEVEL 2 AREAS SUMMARY

Table 5 displays areas and precent cover of all Level 1 and 2 categories identified in the Park. The Valley Bottom associated with the Battle River and Big Knife Creek covers the largest portion of the Park (133.97 ha or 45.02% of the total area), followed by Valley Slopes (93.21 ha or 31.32%), Uplands (44.20 ha or 14.86%) and Disturbed areas (26.16 ha or 8.8%). The most extensive Level 1 landscape feature is the broad fluvial terrace (Vf3) along the Battle River covering a total of 69.27 hectares or almost a quarter (23.28%) of the Park's total area. The broad, relatively steep predominantly north-facing valley slopes (Vp1) are the second most extensive Level 1 unit. These valley slopes cover approximately 50 hectares or 16.78% of the Park's total area. Vp3 units representing the broad fluvial aprons at the base of valley slopes cover 32.25 hectares or 10.83%.

Table 6 lists the Level 2 Classes and their total area in hectares and percent cover in the Park. Vegetation types on drier non-wetland sites are predominantly Woodlands (deciduous, mixed, coniferous) at almost half (48.31%) of the total area of the Park which calculates out to 143.76 hectares. Low and tall shrublands make up about a quarter (23.94% or 71.20 hectares) and grasslands occupy 8.22% (24.48 hectares). Wetlands consisting of wet meadows, wet tall shrublands, shallow marshes, deep marshes and open water cover a total of 35.18 hectares or 11.82%. The remainder of the Level 2 cover classes consist of areas disturbed by human activity (e.g. campgrounds, roads, parking lots, Park residences and yards, old excavations) at 6.04% or 17.96 hectares, and non-vegetated bedrock slopes at 1.67% or 4.96 hectares.

Table 5: Areas and Percent Cover of Level 1 and Level 2 Features in Big Knife Provincial Park

Uplands - 44.20 ha; 14.86% of Total Park Area						
Level 1 (Landscape Types)				**Level 2 (Vegetation Types)**		
Type (Theme)	**Code**	**Area in Hectares**	**% of Total Park Area**	**Classes**	**Area in Hectares**	**% of Total Park Area**
Upland - Non-Sandy (Ground Moraine)	Ng1	7.95	2.68	G - Grassland	1.36	0.46
				LS - Low Shrubland	2.64	0.89
				TS - Tall Shrubland	1.57	0.53
				DW -Deciduous Woodland	2.38	0.80
	Ng2	3.19	1.07	G - Grassland	0.21	0.07
				LS - Low Shrubland	0.24	0.08
				TS - Tall Shrubland	1.28	0.43
				DW - Deciduous Woodland	1.46	0.49
Upland Sandy (Sandy Plain)	Ss1	33.06	11.11	G - Grassland	0.05	0.02
				LS - Low Shrubland	3.25	1.09
				TS - Tall Shrubland	3.33	1.12
				DW - Deciduous Woodland	26.43	8.88

Valley Slopes - 93.21 ha; 31.32% of Total Park Area						
Level 1 (Landscape Types)				**Level 2 (Vegetation Types)**		
Type (Theme)	**Code**	**Area in Hectares**	**% of Total Park Area**	**Classes**	**Area in Hectares**	**% of Total Park Area**
Valley/ Ridge (Protected Slope)	Vp1	49.94	16.78	G - Grassland	0.16	0.05
				LS - Low Shrubland	1.25	0.42
				TS - Tall Shrubland	3.37	1.13
				DW - Deciduous Woodland	30.65	10.30
				MW - Mixed Woodland	9.30	3.13
				CW - Coniferous Woodland	5.21	1.75
	Vp2	3.94	1.32	G - Grassland	1.95	0.65
				LS - Low Shrubland	0.23	0.08
				TS - Tall Shrubland	0.35	0.12
				DW - Deciduous Woodland	1.41	0.47
	Vp3	32.25	10.83	G - Grassland	8.49	2.85
				LS - Low Shrubland	3.37	1.13
				TS - Tall Shrubland	2.11	0.71
				DW - Deciduous Woodland	14.51	4.88
				MW - Mixed Woodland	0.07	0.02
				CW - Coniferous Woodland	3.01	1.01
				TSW - Wet Tall Shrubland	0.69	0.23
	Vp4	0.35	0.12	LS - Low Shrubland	0.35	0.12
Valley/Ridge (Springs)	Vs	0.69	0.23	WM - Wet Meadow	0.69	0.23
Valley/Ridge (Exposed Slope)	Vx	6.04	2.04	LS - Low Shrubland	0.41	0.14
				TS - Tall Shrubland	0.03	0.01
				DW - Deciduous Woodland	0.64	0.22
				NV - Non-vegetated	4.96	1.67

Valley Bottom - 133.97 hectares; 45.02% of Total Park Area						
Level 1 (Landscape Types)				**Level 2 (Vegetation Types)**		
Type (Theme)	**Code**	**Area in Hectares**	**% of Total Park Area**	**Classes**	**Area in Hectares**	**% of Total Park Area**
Valley/Ridge (Floor/Stream)	Vf1	4.74	1.59	CW - Coniferous Woodland	2.37	0.80
				OW - Open Water	2.37	0.80
	Vf2	17.68	5.93	DW - Deciduous Woodland	0.25	0.08
				MW - Mixed Woodland	0.77	0.26
				CW - Coniferous Woodland	13.58	4.56
				TSW - Wet Tall Shrubland	3.08	1.03
	Vf3	69.27	23.28	G - Grassland	1.73	0.58
				LS - Low Shrubland	31.66	10.64
				TS - Tall Shrubland	9.75	3.28
				DW - Deciduous Woodland	24.05	8.08
				CW - Coniferous Woodland	2.08	0.70
	Vf4	8.88	2.99	G - Grassland	3.62	1.22
				LS - Low Shrubland	2.72	0.91
				TS - Tall Shrubland	0.29	0.10
				DW - Deciduous Woodland	2.25	0.76
	Vf5	12.01	4.04	LS - Low Shrubland	0.84	0.28
				DW - Deciduous Woodland	0.26	0.09
				TS - Tall Shrubland	0.56	0.19
				TSW - Wet Tall Shrubland	8.92	3.00
				WM - Wet Meadow	0.09	0.03
				OW - Open Water	1.34	0.45
	Vf6	1.8	0.61	SM - Shallow Marsh	1.80	0.61
	Vf7	7.03	2.36	G - Grassland	0.04	0.01
				LS - Low Shrubland	0.27	0.09
				DW - Deciduous Woodland	3.08	1.03
				WM - Wet Meadow	3.16	1.06
				SM - Shallow Marsh	0.48	0.16
Wetland (Deep Marsh)	Wd	7.79	2.62	DM - Deep Marsh	7.79	2.62
Wetland (Lake-Wet Meadow)	WlWm	1.01	0.34	WM - Wet Meadow	0.30	0.10
				OW - Open Water	0.71	0.24
Wetland (Deep Marsh - Floor-Stream)	WdWf5	3.76	1.26	TSW - Wet Tall Shrubland	0.38	0.13
				WM - Wet Meadow	0.75	0.25
				DM - Deep Marsh	2.63	0.88

Disturbed Areas - 26.16 hectares; 8.8% of Total Park Area						
Level 1 (Landscape Types)				**Level 2 (Vegetation Types)**		
Type (Theme)	**Code**	**Area in Hectares**	**% of Total Park Area**	**Classes**	**Area in Hectares**	**% of Total Park Area**
Disturbance	D1	0.94	0.32	TS - Tall Shrubland	0.94	0.32
	D2	17.96	6.04	A - Anthropogenic	17.96	6.04
	D3	0.39	0.13	LS - Low Shrubland	0.39	0.13
	D4	6.87	2.31	G - Grassland	6.87	2.31

Table 6: Areas and Percent Cover of Level 2 Vegetation Types in Big Knife Provincial Park

Level 2 Vegetation Type	Area in Hectares	% of Total Park Area
Grassland (G)	24.48	8.22
Low Shrubland (LS)	47.62	16.00
Tall Shrubland (TS)	23.58	7.94
Deciduous Woodland (DW)	107.37	36.08
Mixed Woodland (MW)	10.14	3.41
Coniferous Woodland (CW)	26.25	8.82
Wet Tall Shrubland (TSW)	13.07	4.39
Wet Meadow (WM)	4.99	1.67
Shallow Marsh (SM)	2.28	0.77
Deep Marsh (DM)	10.42	3.50
Non-vegetated (NV)	4.96	1.67
Anthropogenic (A)	17.96	6.04
Open Water (OW)	4.42	1.49
TOTAL	297.54	100%

11. CONCLUSION

This report provides a comprehensive description of the biological and physical features of Big Knife Provincial Park. The Park for the most part remains naturally vegetated and undisturbed by human activity. The major landscape features of the Park are the Battle River valley bottom including the lower reaches of Big Knife Creek and an unnamed tributary, the northern portion of an upland in the south, isolated buttes (representing remnants of this upland), and a broad north-facing valley slope that connects the southern upland to the valley bottom below. Surficial deposits covering this landscape consist of morainal material and glaciofluvial veneers over moraine on the uplands and butte remants, moraine on the broad north-facing valley slope, and extensive fluvial sediments on terraces and more recent floodplains along the Battle River and Big Knife Creek. Scattered occurrences of steep exposures (primarily south facing) of Cretaceous bedrock forming local badlands are evident in the slopes descending from the uplands and buttes to the valley bottom. Strongly to weakly saline fluvial fans and aprons extend onto the valley bottom at the base of valley slopes. Remnant channels and former oxbow lakes once part of the Battle River stream course are evident throughout the valley bottom.

A wide variety of vegetation types occur on drier sites including the uplands, valley slopes and valley bottom. These range from open grasslands to shrublands to woodlands. Many of the grasslands located throughout the Park represent rare remnants of plains rough fescue communities, which at one time covered vast areas of the Parkland Region prior to European settlement. Wetland vegetation communities in the Park are associated with remnants of the Battle River stream channel, two springs discharging from mid-slopes positions on the broad north-facing valley slope and lowlying areas along the Battle River and Big Knife Creek and its tributary. Wetland types consist of wet tall shrublands along

Big Knife Creek, shallow marshes and wet meadows in poorly drained remnant channels and deep marshes along the current channel of the Battle River. The Park is home to at least 270 vascular plants and 5 fern or fern ally plant species, most of which are native (McIsaac and Macdonald, 1993).

Big Knife Provincial Park provides habitat to a significant number of faunal species indicated on checklists (Mammals, Birds, Amphibians, Reptiles, and Fish) prepared for the Park (Macdonald and McIsaac, 1993a; Macdonald and McIsaac, 1993b). The Park represents a remnant of critical, undisturbed, natural Battle River valley and upland habitats, which have disappeared in other parts of the Central Parkland Natural Subregion as a result of agricultural and industrial activity.

11.1 Suggestions for Further Study

1) Conduct a detailed inventory of all smooth brome infestations and delineate these occurrences on a large-scale map. This will determine the extent of smooth brome in the Park. Follow this with a program to determine whether smooth brome is encroaching, and if so, at what rate. This is especially important for native grassland communities with a significant component of plains rough fescue (*Festuca hallii*). Monitoring may be by means of simple transects where the edge of the brome communities (identified from the previous detailed inventory) can be measured at regular intervals over time. The monitoring study should include a review of available literature to determine methods of mitigating smooth brome encroachment and possibly eliminating or at least reducing the extent of this invasive grass species.

2) Conduct a detailed investigation of shrub encroachment particularly into areas of grassland containing a large component of plains rough fescue to determine whether shrubs such as buckbrush (*Symphoricarpos occidentalis*) are taking over these grasslands and eliminating the fescue.

3) Investigate the site, soils and vegetation species composition and cover at the second spring identified by Greenlee, (1983). This spring is on the north-facing valley slope near the Park's eastern boundary in the NW quarter of Section 34, Township 40, Range 16, West of the 4th Meridian.

4) Collect tree mensuration data (tree heights, age and diameters at breast height) in the deciduous, mixedwood and coniferous forest community types to gather additional information on these communities and determine from this information the significance of these communities in the Parkland Region. One question that could be answered is whether some of these community types are actually old growth.

5) Conduct vegetation field surveys earlier in the growing season to observe and document flora missed during this study.

6) Conduct detailed surveys of non-vascular plants such as mosses, lichens and liverworts throughout the course of a growing season.

7) Conduct detailed surveys of vertebrate species including habitat requirements to supplement and update existing species lists for the Park.

8) Conduct detailed surveys of invertebrate species (insects, spiders, etc.) to complete the inventory of biological resources in the Park.

9) Conduct a geologic and palentological survey of exposed bedrock formations in the badlands exposed along the buttes in the western portion of the Park to confirm the occurrences of partially petrified burned wood (mentioned in the Alberta Provincial Parks Master Plan Programme Objectives and Methodology; Department of Lands and Forest, year unknown), as well as identifying other fossils.

Plate 1: **Example of local badlands (Vx) along a butte in the south-western portion of the Park. The steep bedrock exposure reveals Upper Cretaceous sedimentary bedrock consisting of the darker Horseshoe Canyon formation on top and the lighter, deeply rilled Bearpaw formation below. Note the mini hoodoo features located in the lower portion of the Bearpaw formation.**

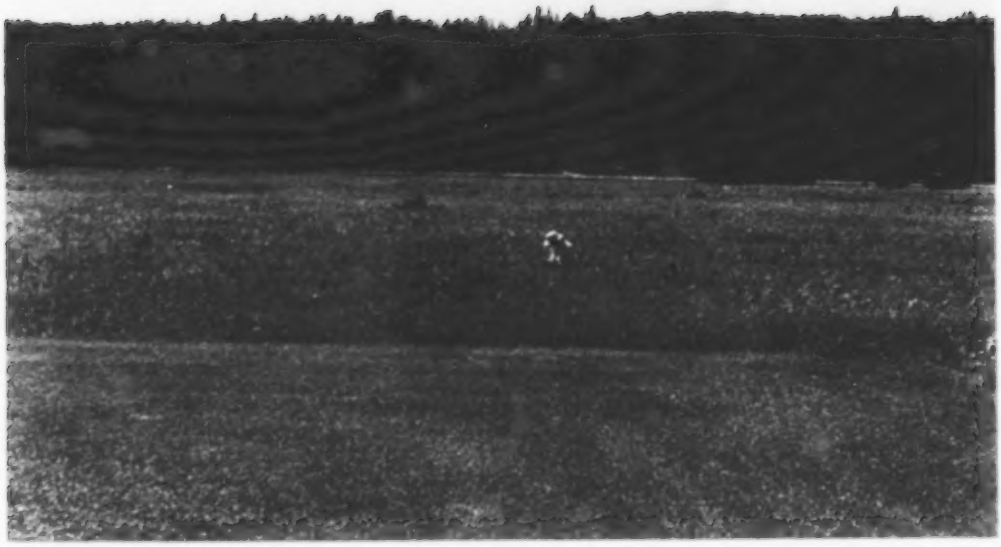


Plate 2: **Level, former cultivated field now a sports field (D4) immediately south of the campground. Dominant vegetation species growing on this disturbed area is non-native smooth brome growing on moderately well drained to imperfectly drained medium textured fluvial terrace deposits. Dominant soils range from Orthic Black Chernozems to Gleyed Black Chernozems. Site 3 was located in this field.**

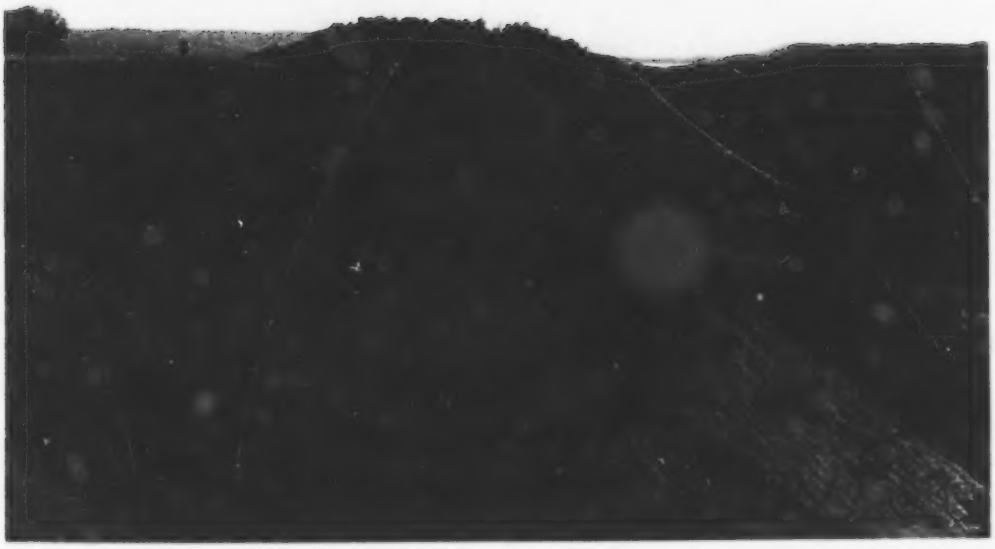


Plate 3: View looking east across the top of a small butte representing a remnant of the uplands. Plains Rough Fescue - Kentucky Blue Grass community (Site 23a) occurs on the top of the butte overlain by medium textured morainal deposits (Ng1). Dominant soils on the uplands are well drained Orthic Black Chernozems. The Sand Grass - Muhly Grass community grows on the drier upper south-facing slopes (Vx) consisting of thin colluvial veneers draped over bedrock.

Plate 4: **Plains Rough Fescue - Kentucky Blue Grass community at Site 15 in mid-ground growing on medium textured morainal deposits on the southern upland (Ng1). Dominant soils are well drained Orthic Black Chernozems. Low shrub patches consist of buckbrush.**

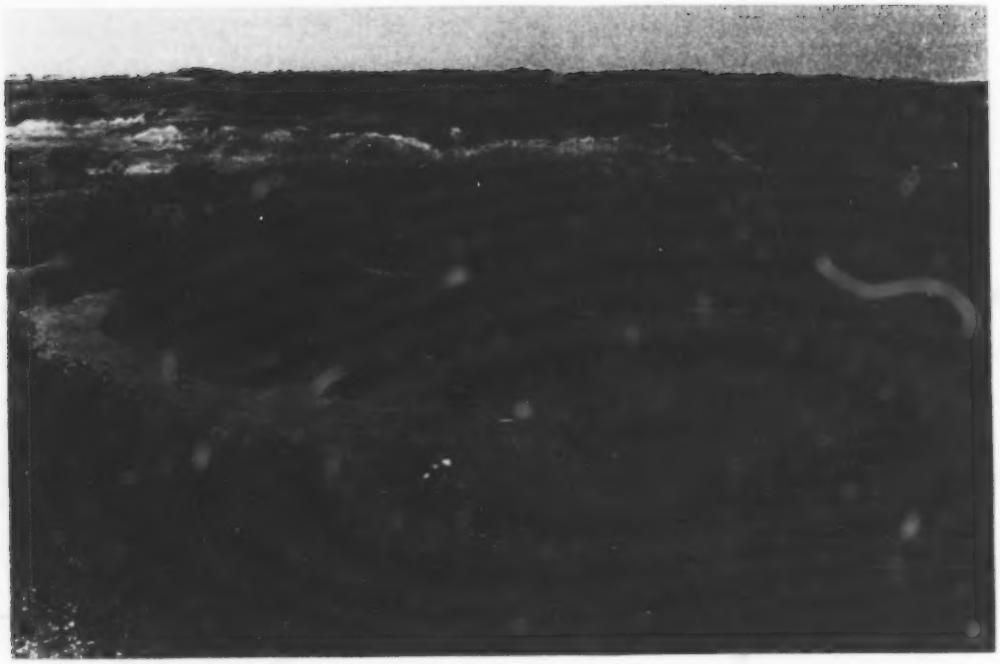


Plate 5: Looking north at the Battle River bottomland. Shrubs and aspen grow on the non-saline medium to coarse textured fluvial terrace deposits (Vf3) while open grassland represented primarily by the Kentucky Blue Grass - Western Wheat Grass community occurs on coarse to fine textured saline fluvial apron deposits and shallow channels (Vf4). Soils on the terraces are well drained Orthic Black Chernozems while moderately well drained Orthic Regosols (saline phase) to Black Solodized Solonetz's have developed on the fluvial aprons and shallow channels.

Plate 6: **Buckbrush community on medium textured Battle River fluvial terrace deposits (Vf3) at Site 37. The dominant soils are well drained Orthic Black Chernozems.**

Plate 7: **Silverberry - Buckbrush community on medium textured fluvial terrace deposits (Vf3) at Site 36 in the Battle River valley bottomland. Extensive understory of common nettle exists at this site. Well drained Orthic Black Chernozems are the dominant soils.**

Plate 8: **Aspen / Buckbrush - Wild Red Raspberry - Rose woodland on medium to coarse textured glaciofluval veneer over moraine (Ss1) at Site 17 located on the southern uplands in the extreme south-western corner of the Park. Note the dense cover of smooth brome in the foreground. The dominant soils are well drained Orthic Black Chernozems.**

Plate 9: **Aspen / Chokecherry - Saskatoon woodland at Site 27 on well drained medium textured fluvial terrace deposits (Vf3) in the Battle River valley bottom. Dominant soils are well drained Orthic Black Chernozems.**

Plate 10: **Aspen - Balsam Poplar (White Spruce - Black Spruce) / Beaked Hazelnut woodland at Site 35 developed on medium textured morainal deposits on a 35% north-facing valley slope (lower to midslope position of Vp1) descending from a local butte (remnant upland). Dominant soils are well drained Orthic Eutric Brunisols.**

Plate 11: **White Spruce / Rose woodland community on coarse textured fluvial floodplain deposits along Big Knife Creek (Vf2) at Site 41. Soils at the site are rapidly drained Orthic Regosols.**

Plate 12: **Looking down slope at a (White Spruce) / Willow - River Alder - Red-osier Dogwood wet tall shrub c mmunity at Site 20 (extreme right) on course to medium textured fluvial apron deposits (Vp3) adjacent to the Big Knife Creek floodplain (Vf2). The site is adjacent to wetter areas of the floodplain overgrown with the same wet tall shrub community. Soils at the site are well drained Cumulic Regosols.**

Plate 13: **Closer view of the tall shrubs and understory in the (White Spruce) / Willow - River Alder - Red-osier Dogwood wet tall shrub community at Site 20.**

Plate 14: **Shallow marsh in an abandoned fluvial channel overlain by fine textured, local lacustrine sediments (Vf6) at Site 28. The dominant vegetation species on this poorly to very poorly drained site is awned sedge. Dominant soils are Rego Gleysols.**

Plate 15: **Emergent Common Cattail community in a very poorly drained deep marsh (Wd) at Site 3 along the Battle River shoreline. Parent materials are coarse to medium fluvial floodplain sediments. Dominant soils are Rego Gleysols under water.**

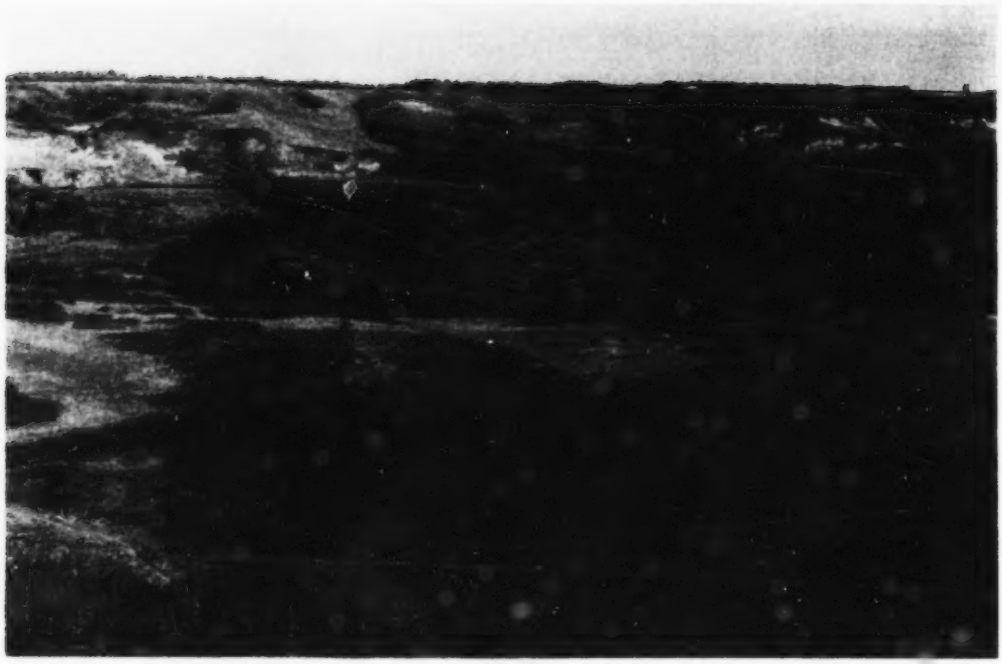


Plate 16: **Panoramic view looking north at the Battle River valley bottom and meandering river channel. Plant communities consist of deciduous woodland and tall shrubland types on medium textured fluvial terrace deposits (Vf3), Kentucky Blue Grass - Western Wheat Grass community and deciduous woodland type on thin, saline medium to fine fluvial apron sediments (Vf4), and Common Cattail emergent vegetation community in deep marshes (Wd) occurring as vegetated fringes along the shoreline and islands in the Battle River channel.**

12. REFERENCES

Achuff, P. L. 1994. **Natural Regions, Subregions and Natural History Themes of Alberta: A Classification for Protected Areas Management**. Prepared for Parks Services, Alberta Environmental Protection. 72 pages.

Adams, G. D. 1988. Wetlands of the Prairies of Canada. In **Wetlands of Canada**. Ecological Land Classification Series, No. 24. prepared by the National Wetlands Working Group. Sustainable Development Branch, Environment Canada, Ottawa, Ontario, and Polyscience Publications Inc., Montreal, Quebec. pages 155 to 194.

Adams, W. J. 1971. **Preliminary Natural History Inventory: Big Knife Provincial Park.**

Aiken, S. G. and S. J. Darbyshire. 1990. **Fescue Grasses of Canada**. Agriculture Canada Publication 1844/E.

Alberta Environmental Protection. 1993. **Alberta Plants and Fungi - Master Species List and Species Group Checklist**. Alberta Environmental Protection, Edmonton, Alberta.

Alberta Environmental Protection. 1994a. **Alberta Protected Areas System Analysis Report 3 (1994)**. Alberta Environmental Protection, Edmonton, Alberta.

Alberta Environmental Protection. 1994b. **Ecological Land Survey Site Description Manual**. Canadian Forest Service and Alberta Land and Forest Services, Edmonton, Alberta. 166 pages.

Alberta Environmental Protection. 1996. **The Status of Alberta Wildlife.** Wildlife Management Division, Natural Resources Service, Alberta Environmental Protection. 44 pages.

Alberta Environmental Protection. 1997. **The Parkland Natural Region of Alberta**. Recreation and Protected Areas Division, Natural Resources Service, Alberta Environmental Protection, Edmonton, Alberta. 111 pages and maps.

Alberta Natural Heritage Information Centre. 1999a. **Plant Species of Special Concern (Tracking and Watch Lists for Vascular Plants and Mosses)**. Alberta Natural Heritage Information Centre, Edmonton, Alberta.

Alberta Natural Heritage Information Centre. 1999b. **Preliminary Plant Community Tracking List**. Alberta Natural Heritage Information Centre, Edmonton, Alberta.

Allen, L. 1999. **Personal communication**.

Archibald, J. H., G. D. Klappstein and I. G. W. Corns. 1996. **Field Guide to Ecosites of Southwestern Alberta**. Natural Resources Canada, Canadian Forestry Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta. Special Report 8.

Beckingham, J. D. and J. H. Archibald. 1996. **Field Guide to Ecosites of Northern Alberta**. Natural Resources Canada, Canadian Forestry Service, Northwest Region, Northern Forest Research Centre, Edmonton, Alberta. Special Report 5.

Beckingham, J. D., I. G. W. Corns and J. H. Archibald. 1996. **Field Guide to Ecosites of West-central Alberta**. Natural Resources Canada, Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta. Special Report 9.

Bjorge, R. R. 1996. Recent Occupation of the Alberta Aspen Parkland Ecoregion by Moose. **Alces**. Vol. 32. pages 141-147.

Bjorge, R. R. 1999. **Personal communication**.

Buchwald, V. 1999. **Personal communication**.

Christiansen, D. G. 1977. **Battle River Basin Study: Fisheries and Wildlife Section**. Battle River Basin Study Background Information Report #8. 265 pages.

COSEWIC. 1998. **List of Species at Risk, April 1998**. Committe of the Status of Endangered Wildlife in Canada. 25 pages.

Department of Lands and Forests. Year Unknown. **Alberta Provincial Parks: Master Plan Programme Objectives and Methodology**. Parks Planning Branch, Department of Lands and Forests, Edmonton, Alberta.

Downing, D., W. K. Hay, E. Karpuk and D. Bradshaw. 1989. **Biophysical Inventory of the Proposed Yamnuska Natural Area**. Resource Information Branch, Land Information Services Division, Alberta Forestry, Lands and Wildlife. 118 pages and maps.

Ebel, R., D. Poll, and B. Finkelman. 1973. **An Ecological Survey of Big Knife Provincial Park 1973**. Provincial Parks Planning, Dept. of Lands and Forests, Government of Alberta. 36 pages.

Environment Canada. 1993. **Canadian Climate Normals, 1961-1990, Prairie Provinces**. Atmospheric Environment Service, Environment Canada, Ottawa.

Fedirchuk, G. J., R. J. Heitzmann and B. M. Newton. 1982. **Historical Resources Impact Assessment Proposed Alberta Provincial Parks Development Projects: Final Report**. Project 81-111-C prepared for Archaeological Survey of Alberta on behalf of Alberta Recreation and Parks. 43 pages.

Fehr, A. W. 1982. **The Candidate Rumsey Ecological Reserve - a Biophysical Inventory**. Natural Areas Technical Report No. 5. ENR Report No. T/69. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Edmonton.

Fehr, A. W. 1984. **Wainwright study area - a Biophysical Inventory**. Natural Areas Technical Report No. 15. Public Lands Division, Alberta Energy and Natural Resources, Edmonton. 153 pages.

Finlay, J. and C. Finlay. 1987. **Parks in Alberta: A Guide to Peaks, Ponds, Parklands and Prairies**. Hurtig Publishers, Edmonton, Alberta.

Gould, J. 1999. **Personal communication**.

Green, R. 1972. **Geologic Map of Alberta**. Natural Resources Division, Alberta Research Council, Edmonton, Alberta.

Greenlee, G. A. 1983. **Soil Survey of Big Knife Provincial Park and Interpretation for Recreational Use**. Alberta Institute of Pedology, Alberta Research Council, Report No. M-83-1. 45 pages and maps.

Hamilton, W. N., M. C. Price and C. W. Langenburg. 1999. **Geologic Map of Alberta**. Alberta Geological Survey, Alberta Energy and Utilities Board, Edmonton.

Hamilton, I. M., J. L. Skilnick, H. Troughton, A. P. Russell, and G.L. Powell. 1998. **Status of the Canadian Toad (Bufo hemiophyrs) in Alberta**. Alberta Environmental Protection, Wildlife Management Division, and the Alberta Conservation Association, Wildlife Status Report No. 12, Edmonton, Alberta. 30 pages.

Hunter, D. 1999. **Personal communication**.

Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar. 1995. **Plants of the Western Boreal Forest and Aspen Parkland**. Lone Pine Publishing, Edmonton, Alberta. 392 pages.

Kocaoglu, S. S., 1990. **Physical Land Classification Methodology**. Resource Inventory Section, Land Information Branch, Department of Forestry, Lands and Wildlife, Edmonton, Alberta. 41 pages.

Macdonald, C. and P. McIsaac (compilers). 1993a. **Big Knife Provincial Park Birds**. Alberta's Watchable Wildlife Checklist Series. Government of Alberta.

Macdonald, C. and P. McIsaac (compilers). 1993b. **Big Knife Provincial Park Fish, Amphibians, Reptiles and Mammals.** Alberta's Watchable Wildlife Checklist Series. Government of Alberta.

MacGregor, J. G. 1976. **The Battle River Valley**. Published by Western Producer Prairie Books, Saskatoon, Saskatchewan. 174 pages.

McIsaac, P. and C. Macdonald. 1993. **Big Knife Provincial Park Plants**. Alberta's Watchable Wildlife Checklist Series.

Meijer, M. and E. Karpuk. 1999. **The Biophysical Inventory of Dillberry Provincial Park (draft).** Alberta Environment.

Millar, J. B. 1976. **Wetland Classification in Western Canada: A Guide to Marshes and Shallow Open Water Wetlands in The Grasslands and Parklands of the Prairie Provinces**. Canadian Wildlife Service Report Series No. 37. Canada Wildlife Service, Environment Canada. 38 pages.

Moss, E. H. 1983. **Flora of Alberta, Second Edition**. Revised by J.G. Packer. University of Toronto Press, Toronto, Ontario. 687 pages.

National Wetlands Working Group. 1988. **Wetlands of Canada**. Ecological Land Classification Series, No. 24. Sustainable Development Branch, Environment Canada, Ottawa, Ontario, and Polyscience Publications Inc., Montreal, Quebec. 452 pages.

Nesby, R. (compiler). 1997. **Alberta Vegetation Inventory Standards Manual - Version 2.2**. Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 131 pages.

Novak, M., J. A. Baker, M. E. Obbard and B. Malloch (editors). 1987. **Wild Furbearer Management and Conservation in North America**. Ontario Ministry of Natural Resources. 1150 pages.

Peters, J. and L. Ovenden. 1974. **An Ecological Survey of the Vermilion Provincial Park - 1974**. Provincial Parks Planning, Deparement of Lands and Forests, Edmonton, Alberta.

Petry, S. 1998. **Personal communication**.

Roberts, W. 1992. Declines in amphibian populations in Alberta. In **Declines in Canadian Amphibian Populations: Desiging a National Monitoring Strategy**. C.A. Bishop and K.E. Pettit (editors), Canadian Wildlife Service, Environment Canada. pages 14 - 16.

Russell, A. P. and A. M. Bauer. 1993. **The Amphibians and Reptiles of Alberta**. Co-published by the University of Calgary Press, Calgary, Alberta and University of Alberta Press, Edmonton, Alberta.

Schowalter, D. B. 1974. **Letter to D. A. Drinkwater**. Department of Lands and Forests, Alberta Government.

Schutze, A. M., R. Li, M. M. Fenton and S. R. Moran. 1986. **Geology of the Battle River Study Site: Plains Hydrology and Reclamation Project**. RRTAC Report #86-4 prepared for the Reclamation Research Technical Advisory Committee of the Alberta Land Conservation and Reclamation Council. 86 pages.

Semenchuk, G. P. (editor). 1992. **The Atlas of Breeding Birds of Alberta**. Published by the Federation of Alberta Naturalists. 391 pages.

Shetsen, I. 1990. **Quaternary Geology, Central Alberta**. Natural Resource Division, Terrain Sciences Department, Alberta Research Council. Map.

Smith, H. C. 1993. **Alberta Mammals: An Atlas and Guide.** Published by the Provincial Museum of Alberta. 238 pages.

Smith, W. W. and N. Kondla. 1972. **An Ecological Survey of Dry Island Buffalo Jump Provincial Park - 1972, Vol. 1.** Provincial Parks Planning, Department of Lands and Forests, Government of Alberta. 55 pages and maps.

Soil Classification Working Group. 1998. **The Canadian System of Soil Classification**. Agriculture and Agri-Food Canada Publication 1646 (revised). 187 pages.

Stelfox, J. B. and J. G. Stelfox. 1993. Distribution. In **Hoofed Mammals of Aberta**. J.G. Stelfox (editor). Lone Pine Press, Edmonton, Alberta. Pages 45 -61

Sweetgrass Consultants Ltd. 1997. **Environmentally Significant Areas of Alberta: Volumes 1, 2 and 3**. Prepared for the Resource Data Division, Alberta Environmental Protection. 580 pages and appendix.

Van Hienen, T. 1999. **Personal communication**.

Wagner, G. 1997. **Status of the Northern Leopard Frog (Rana pipiens) in Alberta**. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 9, Edmonton, Alberta. 46 pages.

Weerstra, B. G. and A. C. Holcroft Weerstra. 1998. **Preliminary Classification of Plains Rough Fescue (*Festuca hallii*) Community Types within the Central Parkland Subregion of Alberta**. Prepared for the Alberta Natural Heritage Information Centre, Edmonton, Alberta.

Wells, R. E. 1998. **Personal communication**.

Wells, R. E. and W. L. Nikiforuk. 1988. **Soil Survey of the County of Paintearth, Alberta**. Alberta Soil Survey Report No. 49. Terrain Sciences Department, Alberta Research Council, Edmonton, Alberta. 54 pages and 28 maps.

Whitelock, E. 1999. **Personal communication**.

Appendix 1: Description of Site and Soil Characteristics associated with the Level 3 Vegetation Community Descriptions and Appendix 2

Full definitions of the following terms are provided in Ecological Land Survey Site Description Manual (1994), The Canadian System of Soil Classification (Soil Classification Working Group, 1998), and the Physical Land Classification Methodology (Kocaoglu, 1990).

1. Slope:

   Slope at each site representing a particular vegetation community falls into one of the following classes:

   - 0 - 0.5%
   - 0.5 - 2.5%
   - 3 - 5%
   - 6 - 9%
   - 10 - 15%
   - 16 - 30%
   - 31 - 45%
   - 46 - 70%
   - 71 - 100%
   - >100%

2. Aspect:

   Slope aspect or direction at each site representing a particular vegetation community was classified as one of following cardinal directions: N, NE, E, SE, S, SW, W, NW. If there was no measureable slope the site was classed as level.

3. Parent Material represents the surficial geologic deposits at each site. Parent material observed in the Park during 1998 field investigations were:

   - Ft - fluvial terrace
   - Fa - fluvial apron
   - Ff - fluvial fan
   - Ftv/Fa - fluvial terrace veneer (deposit less than one meter) over Fluvial apron
   - Fo - fluvial Floodplain
   - M - moraine (deep morainal deposit)
   - Mvb/R - morainal veneer (deposit less than one meter) to blanket (deposit greater than 1 meter but not masking the configuration of the underlying parent material) over bedrock
   - GFv/M - glaciofluvial veneer (deposit less than one meter) over moraine
   - GFb/M - glaciofluvial blanket (deposit more than one meter but does not mask the configuration of the underlying parent material) over moraine

- Lv/Ft - local lacustrine veneer (deposit less than one meter) over fluvial terrace
- Cv/M - colluvial veneer (deposit less than one meter) over moraine

4. Surface (0 to 25 cm) and Subsurface (25 to 65 cm) texture classes encountered at the sites:

    - C - clay
    - hC - heavy clay
    - SiC - silty clay
    - CL - clay loam
    - SiCL - silty clay loam
    - SCL - sandy clay loam
    - gkSiCL - gravelly and cobbly silty clay loam
    - gkCL - gravelly and cobbly clay loam
    - gkSL - gravelly and cobbly sandy loam
    - S - sand
    - SL - sandy loam
    - LS - loamy sand

5. Soil Subgroups encountered at the sites:

    - O.BL - Orthic Black Chernozem
    - GL.BL - Gleyed Black Chernozem
    - SZ.BL - Solonetzic Black Chernozem
    - O.EB - Orthic Eutric Brunisol
    - BL.SS - Black Solodized Solonetz
    - BL.SZ - Black Solonetz
    - GLBL.SS - Gleyed Black Solodized Solonetz
    - GLBL.SO - Gleyed Black Solod
    - O.R - Orthic Regosol
    - CU.R - Cumulic Regosol
    - O.HG - Orthic Humic Regosol
    - R.G - Rego Gleysol
    - O.G - Orthic Gleysol

6. The full range of drainage classes listed on the Site Description Form (LISD 15B (Rev. 1/97) and their corresponding number codes:

    - very rapidly - 1
    - rapidly - 2
    - well -3
    - moderately well - 4
    - imperfectly - 5
    - poorly - 6
    - very poorly - 6

7. The full range of Meso Site Positions on the Site Description Form (LISD 15B (Rev. 1/97) and their corresponding number codes:

    - crest - 1
    - upper slope - 2
    - middle slope - 3
    - lower slope - 4
    - toe - 5
    - depression - 6
    - level - 7

8. The full range of Ecological Moisture Regime classes on the Site Description Form (LISD 15B (Rev. 1/97) and their corresponding number codes:

    - very xeric (very dry) -1
    - xeric (dry) - 2
    - subxeric (moderately dry) - 3
    - submesic (moderately fresh) - 4
    - mesic (fresh) - 5
    - subhygric (moderately moist) - 6
    - hygric (moist) - 7
    - subhydric (moderately wet) - 8
    - hydric (wet) -9

9. The full range of Nutrient Regime classes on the Site Description Form (LISD 15B (Rev. 1/97) and their corresponding number codes:

    - oligotrophic (very poor) - 1
    - submesotrophic (poor) - 2
    - mesotrophic (medium) - 3
    - permesotrophic (rich) - 4
    - eutrophic (very rich) - 5
    - hypereutrophic (e.g. saline) - 6

10. Topographic Expression descriptions:

    - l - level
    - u - undulating
    - i - inclined
    - s - steep
    - e - depressional
    - E - eroded

Appendix 2: Big Knife Provincial Park 1998 Field Data (sorted by vegetation type and dominant plant species)

Refer to Appendix 1 for key to Meso Site Position, Drainage, Ecological Moisture Regime, Nutrient Regime, Soil Subgroup, Parent Material and Topographic Expression codes

Site #	Slope %	Aspect in degrees	Meso Site Position	Drain-age	Ecological Moisture Regime	Nutrient Regime	Soil Sub-group	Vegetation Type	Dominant Plant Species	Parent Material	Topographic Expression
26	0	none	6	7	9	5	R.G	deep marsh	Common Cattail	Fo	l
21	27	200	2	2	3	2	O.EB	grassland	Sand Grass-Blue Grama-Green Needle Grass-Muhly Grass	Mvb/R	s
22	65	200	4	1	2	2	O.R	grassland (disturbed)	Muhly Grass-Sand Grass	Mvb/R	s
3	0	/	7	4-5	6	4	O.BL-GL.BL	grassland (saline)	Smooth Brome	Ft	l
38	1	355	7	4	3	2	BL.SS	grassland (saline)	Kentucky Bluegrass-Western Wheat Grass	FaE	l
49	7	60	2	4-5	3	6	BL.SS (eroded)	grassland (saline)	Kentucky Bluegrass-Western Wheat Grass-Smooth Brome	Fa	i
31	1	30	3	4	3	3	BL.SS (eroded)	grassland (saline)	Kentucky Bluegrass-Western Wheat Grass-Alkali Bluegrass	Fa	E
69	7	20	3	4	4	2	O.R (saline)	grassland	Pasture sagewort-Kentucky Bluegrass-Western Wheat Grass	Fa	i
61	0	none	7	4	3	2	O.R (saline)	grassland	Kentucky Bluegrass-Western Wheat Grass-Alkali Bluegrass	Fa	
47	4	130	3	4	4	3	BL.SS	grassland (saline)	Kentucky Bluegrass-Plains Rough Fescue	Mvb/R	lu
53	4	80	3	4	3	6	BL.SS	grassland (saline)	Kentucky Bluegrass-Plains Rough Fescue	Fa	iu
57	6	70	4	4	3	2	BL.SS	grassland (saline)	Kentucky Bluegrass-Plains Rough Fescue-Muhly Grass	Fa	i
68	3	180	4	4	4	3	O.BL	grassland	Pasture Sagewort-Plains Rough Fescue-Kentucky Bluegrass	Ft	
60	5	360	2	3	4	3	O.R(saline) - BL.SS	grassland	Tufted White Prairie Aster-Prairie Sagewort-Kentucky Bluegrass-Green Needle Grass	Fa	iu
59	0	none	1	3	4	3	O.BL (thin)	grassland	Plains Rough Fescue-Kentucky Blue Grass	M	l
15	2	170	3	3	4	3	O.BL	grassland	Plains Rough Fescue-Kentucky Bluegrass	M	lu
67	3	180	4	4	4	3	BL.SS	grassland	Kentucky Bluegrass-Plains Rough Fescue (Blue Grama)	Fa	
12	5	170	2	4	5	3	BL.SZ	grassland	Kentucky Bluegrass	Fa	i
23A	2	180	7	3	4	3	O.BL	grassland	Kentucky Bluegrass-Plains Rough Fescue	M	lu
58	45-70	190	2	2	3	3	O.DB	shrubland - low	Buckbrush	M	is
23C	2	180	7	3	4	3	O.BL	shrubland - low	Buckbrush	M	lu
66	0	none	7	3	4	3	O.BL	shrubland - low	Buckbrush/Prairie Sagewort/Plains Rough Fescue-Kentucky Bluegrass	Ft	
6	0	none	2	3	4	3	O.BL	shrubland - low	Buckbrush/Plains Rough Fescue	Ft	u
29	2	110	2	3	4	3	O.BL	shrubland - low	Buckbrush/Plains Rough Fescue/Kentucky Bluegrass	Ft	u
30	1	310	7	3	4	3	O.EB	shrubland - low	Buckbrush/Plains Rough Fescue/Kentucky Bluegrass	Ft	lu
33	1	10	3	3	4	3	O.BL	shrubland - low	Buckbrush/Plains Rough Fescue/Kentucky Bluegrass	Ftv/Fa	lu
37	1	110	1	3	4	3	O.BL	shrubland - low	Buckbrush/Kentucky Bluegrass-Plains Rough Fescue	FtE	Elu
63	0	none	7	3	4	3	O.BL	shrubland - low (disturbed)	Buckbrush (Silverberry)/Smooth Brome	M	ul
25	7	90	2	3	4	3	O.BL	shrubland - low) disturb.	Buckbrush-Smooth Brome	Ft	u

Site #	Slope %	Aspect in degrees	Meso Site Position	Drain-age	Ecological Moisture Regime	Nutrient Regime	Soil Sub-group	Vegetation Type	Dominant Plant Species	Parent Material	Topographic Expression
54	4	90	1	3	3	3	O.BL	shrubland - low	Buckbrush-Wild Red Raspberry-Rose	Ft	u
1	2	10	2	3	4	3	O.BL	shrubland - low (disturbed)	Buckbrush-Rose/Smooth Brome	Ft	u
64	0	none	7	3	4	3	O.BL	shrubland - low (disturbed)	Rose/Smooth Brome	M	lu
39	3	270	2	3	5	3	O.EB	shrubland - tall	(Aspen Poplar)/Saskatoon-Chokecherry	Ft	u
56	40	10	2	3	5	3	O.EB	shrubland - tall	Chokecherry-Saskatoon-Red Osier Dogwood-Beaked Hazelnut	Mvb/R	i
16	1	340	7	2	3	3	O.BL	shrubland - tall (disturbed)	Silverberry/Smooth Brome	GFv/M	lu
23B	2	180	7	3	4	3	O.BL	shrubland - tall	Silverberry	M	lu
36	5	250	2	3	4	3	O.BL	shrubland - tall	Silverberry/Buckbrush	Ft	lu
45	3	40	7	4	4	3	O.BL	shrubland - tall (disturbed)	Silverberry-Buckbrush/Smooth Brome	GFv/M	lu
20	2	220	3	3	6	5	CU.R	shrubland - tall	(White Spruce)/Red Osier Dogwood-Rose	Fa	lu
51	4	40	2	6	6	5	R.G	shrubland - tall	(White Spruce)/Willow-Red Osier Dogwood	Fo	u
14	2	180	7	6	8	5	O.HG	shrubland - tall	Willow-River Alder-Red Osier Dogwood/Marsh Reed Grass	Fo	lu
24	0	0	7	6	7	5	R.G	shrubland - tall	Willow-Red Osier Dogwood-Pincherry	Fo	l
4	2	160	3	6	7	5	O.G	shrubland - tall	(White Spruce)/River Alder	Fo	l
52	1	120	6	5	7	6	GLBL.SO - GLBL.SS	wet meadow - grass	Awned Northern Wheat Grass-Slough Grass-Foxtail Barley	Lv/Ft	el
5	0	0	6	7	9	5	R.G	wet meadow - grass	Marsh Reed Grass	Fo	l
28	0	0	6	6	8	5	R.G	wet meadow - sedge	Awned Sedge	Lv/Ft	el
65	0	0	6	6	8	4	R.G	wet meadow - sedge	Awned Sedge	Lv/Ft	
32	0	0	6-7	6	8	5	R.G	wet meadow - sedge	Awned Sedge-Common Tall Manna Grass	Lv/Ft	il
46	13	25	2	7	9	5	R.G	wet meadow - spring	Awned Sedge-Water Sedge	Mvb/R	i
42	4	340	2	3	4	3	O.EB	woodland - coniferous	White Spruce/Rose/Moss	Fo	u
41	4	290	2	2	3	2	O.R	woodland - coniferous	White Spruce/Rose/Forbs/Moss	Fo	lu
13	18	20	3	3	5	3	BL.SS	woodland - coniferous	White Spruce/Rose/Stair-step Moss	Fa	i
40	5	290	2	2	4	3	O.EB	woodland - coniferous	White Spruce/Rose/Feather Moss	Fo	u
70	8	20	4	3	6	4	CU.R	woodland - deciduous	Balsam Poplar-Aspen Poplar/Red Osier Dogwood-Saskatoon/Buckbrush	Fa	i
50	6	45	3	4	6	4	SZ.BL	woodland - deciduous	Aspen Poplar (Balsam Poplar)/Red Osier Dogwood/Wild Sarsparilla	Fa	i
62	1	360	7	3	4	3	O.BL	woodland - deciduous (disturbed)	Aspen Poplar/Wild Red Raspberry-Buckbrush	GFb/M	l
18	1	360	7	3	5	3	O.BL	woodland - deciduous (disturbed)	Aspen Poplar/Wild Red Raspberry-Buckbrush/Common Nettle	GFv/M	lu
2	10	2	7	3	5	3	O.BL	woodland - deciduous (disturbed)	Aspen Poplar/Buckbrush-Wild Red Raspberry/Smooth Brome-Sprengel's Sedge	Ft	lu
17	1	40	7	3	4	3	O.BL	woodland - deciduous (disturbed)	Aspen Poplar/Buckbrush-Wild Red Raspberry-Rose/Smooth Brome	GFv/M	lu
19	0	none	7	3	5	3	O.BL	woodland - deciduous (disturbed)	Aspen Poplar/Rose/Smooth Brome	GFv/M	lu

Site #	Slope %	Aspect in degrees	Meso Site Position	Drain-age	Ecological Moisture Regime	Nutrient Regime	Soil Sub-group	Vegetation Type	Dominant Plant Species	Parent Material	Topographic Expression
27	1	230	3	3	5	3	O.BL	woodland - deciduous	Aspen Poplar/Saskatoon/Rose	Ft	lu
8	6	360	4	3	5	3	O.BL	woodland - deciduous	Aspen Poplar/Chokecherry-Aspen Poplar/Forbs	GFv/M	u
34	7	80	2	3	5	3	CU.R	woodland - deciduous	Aspen Poplar/Rose-Chokecherry/Wild Sarsparilla	Ff	i
10	22	340	2	3	6	3	O.EB//O.BL	woodland - deciduous	Aspen Poplar (Balsam Poplar-White Spruce)/Aspen Poplar-Beaked Hazelnut/Wild Sarsparilla	M	i
44	58	50	2	3	5	3	O.EB	woodland - deciduous	Aspen Poplar-Balsam Poplar(White Spruce-Black Spruce)/Beaked Hazelnut-Chokecherry-Rose-Red Osier Dogwood-Wild Red Raspberry	Mvb/R	s
48	3	15	2	4	5	4	SZ.BL	woodland - deciduous	Aspen Poplar-Balsam Poplar/Beaked Hazelnut-Saskatoon-Wild Red Raspberry-Red Osier Dogwood/Wild Sarsparilla	Mvb/R	u
9	55	30	3	2	6	3	O.EB	woodland - deciduous	Aspen Poplar-Balsam Poplar/Beaked Hazelnut-Chokecherry/Wild Sarsparilla	Mb/R	is
35	30	34	3	3	5	3	O.EB	woodland - deciduous	Aspen Poplar/Beaked Hazelnut/Wild Sarsparilla	Mvb/R	i
7	11	110	3	5	7	4	GL.BL	woodland - deciduous	Aspen Poplar/Wild Red Raspberry	Ft	i
55	2	350	6	5	7	6	GLBL.SO	woodland - deciduous	Aspen Poplar/Buckbrush-Rose	Fa	e
11	12	320	2	4	6	3	CU.R	woodland - mixedwood	White Spruce-Aspen Poplar (Balsam Poplar)/Rose	Fav/M	i
43	28	30	4	3	5	3	O.EB	woodland - mixedwood	White Spruce-Aspen Poplar (Balsam Poplar)/Rose	Cv/M	i

Appendix 3: Big Knife Provincial Park Plant Species List

Note: This not an exhaustive list, but represents those species encountered at field sample sites in the Park in 1998 and some species observed during traverses to the sites.

Growth Form: g = grasses, rushes and sedges; f = forbs and ferns; s = shrubs; t = trees; m = mosses; l = lichens

Species Code	Growth Form	Latin Name	Common Name
ACERNEG	s	*Acer negundo*	Manitoba maple
ACHIMIL	f	*Achillea millefolium*	common yarrow
ACHISIB	f	*Achillea sibirica*	many-flowered yarrow
ACTARUB	f	*Actaea rubra*	red and white baneberry
AGASFOE	f	*Agastache foeniculum*	giant hyssop
AGRISTR	f	*Agrimonia striata*	agrimony
AGROSCA	g	*Agrostis scabra*	rough hair grass
AGROPEC	g	*Agropyron pectiniforme*	crested wheat grass
AGROSMI	g	*Agropyron smithii*	western wheat grass
AGROREP	g	*Agropyron repens*	quack grass
AGROSTO	g	*Agropyron stolonifera*	redtop
AGROTRA	g	*Agropyron trachycaulum*	slender wheat grass
ALNUTEN	s	*Alnus tenuifolia*	river alder
ALOPAEQ	g	*Alopecurus aequalis*	short-awned foxtail
AMEL ALN	s	*Amelanchier alnifolia*	saskatoon
ANEMCAN	f	*Anemone canadensis*	Canada anemone
ANEMMUL	f	*Anemone multifida*	cut-leaved anemone
ANEMPAT	f	*Anemone patens*	prairie crocus
ANTESPP	f	*Antennaria* spp	everlasting species
APOCAND	f	*Apocynum androsaemifolium*	spreading dogbane
AQUIBRE	f	Aquilegia brevistyla	blue columbine
ARALNUD	f	*Aralia nudicaulis*	wild sarsaparilla
ARTEBIE	f	*Artemisia biennis*	bienniel sagewort
ARTECAM	f	*Artemisia campestris*	plains wormwood
ARTEFRI	f	*Artemisia frigida*	pasture sagewort
ARTELON	s	*Artemisia longifolia*	long-leaved sagewort
ARTELUD	f	*Artemisia ludoviciana*	prairie sagewort
ASTECIL	f	*Aster ciliolatus*	Lindley's aster
ASTECON	f	*Aster conspicuus*	showy aster
ASTEERI	f	*Aster ericoides*	tufted white prairie aster
ASTELAE	f	*Aster laevis*	smooth aster
ASTESPP	f	*Aster* spp	aster species
ASTRCAN	f	*Astragalus canadensis*	Canadian milk vetch
ASTRSPP	f	*Astragalus* spp	milk vetch species
ASTRSTR	f	*Astragalus striatus*	ascending purple milk vetch
AXYRAMA	f	*Axyris amaranthoides*	Russian pigweed
BECKSYZ	g	*Beckmannia syzigachne*	slough grass
BETUPAP	t	*Betula papyrifera*	white birch
BOUTGRA	g	*Bouteloua gracilis*	blue grama
BRACSPP	m	*Brachythecium* spp	
BROMCIL	g	*Bromus ciliatus*	fringed brome
BROMINE	g	*Bromus inermis*	smooth brome
CALACAN	g	*Calamagrostis canadensis*	bluejoint
CALAINE	g	*Calamagrostis inexpansa*	northern reed grass
CALALON	g	*Calamovilfa longifolia*	sand grass
CAMPROT	f	*Campanula rotundifolia*	harebell
CAPSBUR	f	*Capsella bursa-pastoris*	shepherd's purse
CARAARB	s	*Caragana arborescens*	common caragana
CAREAQU	g	*Carex aquatilis*	water sedge
CAREATH	g	*Carex atherodes*	awned sedge
CAREDIA	g	*Carex diandra*	two-stamened sedge
CAREDIS	g	*Carex disperma*	two-seeded sedge
CAREOBT	g	*Carex obtusata*	blunt sedge
CAREPRG	g	*Carex praegracilis*	graceful sedge

Species Code	Growth Form	Latin Name	Common Name
CAREPRT	g	*Carex praticola*	meadow sedge
CARESPP	g	*Carex* spp	sedge species
CARESPR	g	*Carex sprengelii*	Sprengel's sedge
CAREUTR	g	*Carex utriculata*	small bottle sedge
CHENALB	f	*Chenopodium album*	lamb's quarters
CICUMAC	f	*Cicuta maculata*	water-hemlock
CIRSARV	f	*Cirsium arvense*	Canada thistle
CIRSDRU	f	*Cirsium drummondii*	Drummond's thistle
CIRSFLO	f	*Cirsium flodmanii*	Flodman's thistle
CLEMOCC	s	*Clematis occidentalis*	purple clematis
COMAUMB	f	*Comandra umbellata*	bastard toadflax
CORNSTO	s	*Cornus stolonifera*	red-osier dogwood
CORYCOR	s	*Corylus cornuta*	beaked hazelnut
DESCCES	g	*Deschampsia cespitosa*	tufted hair grass
DISPTRA	f	*Disporum trachycarpum*	fairybells
ELEACOM	s	*Eleagnus commutata*	silverberry
ELEOPAL	g	*Eleocharis palustris*	creeping spike-rush
ELYMINN	g	*Elymus innovatus*	hairy wild rye
EPILANG	f	*Epilobium angustifolium*	common fireweed
EQUIARV	f	*Equisetum arvense*	common horsetail
EQUIHYE	f	*Equisetum hyemale*	common scouring-rush
ERIGGLA	f	*Erigeron glabellus*	smooth fleabane
FESTHAL	g	*Festuca hallii*	plains rough fescue
FRAGVES	f	*Fragaria vesca*	woodland strawberry
FRAGVIR	f	*Fragaria virginiana*	wild strawberry
GAILARI	f	*Gaillardia aristata*	gaillardia
GALETET	f	*Galeopsis tetrahit*	hemp-nettle
GALIBOR	f	*Galium boreale*	northern bedstraw
GALITRF	f	*Galium trifidum*	small bedstraw
GALITRI	f	*Galium triflorum*	sweet-scented bedstraw
GENTAMA	f	*Gentianella amarella*	felwort
GERARIC	f	*Geranium richardsonii*	wild white geranium
GEUMMAC	f	*Geum macrophyllum*	large-leaved yellow avens
GEUMALE	f	*Geum aleppicum*	yellow avens
GEUMTRI	f	*Geum triflorum*	three-flowered avens
GLYCGRA	g	*Glyceria grandis*	common tall manna grass
GRINSQU	f	*Grindelia squarrosa*	gumweed
GUTISAR	f	*Gutierrezia sarothrae*	broomweed
HEDYALP	f	*Hedysarum alpinum*	alpine hedysarum
HELINUT	f	*Helianthus nuttallii*	common tall sunflower
HORDJUB	g	*Hordeum jubatum*	foxtail barley
HYLOSPL	m	*Hylocomium splendens*	feather moss
JUNCBAL	g	*Juncus balticus*	wire rush
KOELMAC	g	*Koeleria macrantha*	june grass
LACTPUL	f	*Lactuca pulchella*	common blue lettuce
LAPPSQU	f	*Lappula squarrosa*	bluebur
LATHOCH	f	*Lathyrus ochroleucus*	cream-colored vetchling
LATHVEN	f	*Lathyrus venosus*	purple peavine
LEMNMIN	f	*Lemna minor*	common duckweed
LINNBOR	f	*Linnaea borealis*	twinflower
LONIDIO	s	*Lonicera dioica*	twining honeysuckle
LYCOASP	f	*Lycopus asper*	western water-horehound
LYGOSPP	f	*Lygodesmia* spp	skeletonweed species
LYSICIL	f	*Lysimachia ciliata*	finged loosestrife
MAIACAN	f	*Maianthemum canadense*	wild lily-of-the-valley
MELIALB	f	*Melilotus alba*	white sweet-clover
MENTARV	f	*Mentha arvensis*	wild mint
MERTPAN	f	*Mertensia paniculata*	tall lungwort
MNIUSPP	m	*Mnium* spp	moss species
MONAFIS	f	*Monarda fistulosa*	wild bergamot
MUHLCUS	g	*Muhlenbergia cuspidata*	plains muhly
OPUNFRA	f	*Opuntia fragilis*	brittle prickly-pear
ORTHSEC	f	*Orthilia secunda*	one-sided wintergreen
PARNPAL	f	*Parnassia palustris*	northern grass-of-parnassus
PELTSPP	l	*Peltigera* spp	lichen

Species Code	Growth Form	Latin Name	Common Name
PENSPRO	f	*Penstemon procerus*	slender blue beardtongue
PHALARU	g	*Phalaris arundinacea*	reed canary grass
PICEGLA	t	*Picea glauca*	white spruce
PICEMAR	t	*Picea mariana*	black spruce
PLEUSCH	m	*Pleurozium scherberi*	big red stem moss
POAINTE	g	*Poa interior*	inland bluegrass
POAJUNC	g	*Poa juncifolia*	alkali bluegrass
POAPALU	g	*Poa palustris*	fowl bluegrass
POAPRAT	g	*Poa pratensis*	Kentucky bluegrass
POPUBAL	t	*Populus balsamifera*	balsam poplar
POPUTRE	t	*Populus tremuloides*	aspen
POTEARG	f	*Potentilla argentea*	silvery cinquefoil
POTEANS	f	*Potentilla anserina*	silverweed
POTEGRA	f	*Potentilla gracilis*	graceful cinquefoil
POTENOR	f	*Potentilla norvegica*	rough cinquefoil
POTEPEN	f	*Potentilla pensylvanica*	prairie cinqfoil
PRUNPEN	s	*Prunus pensylvanica*	pin cherry
PRUNVIR	s	*Prunus virginiana*	choke cherry
PYROASA	f	*Pyrola asarifolia*	common pink wintergreen
PYROELL	f	*Pyrola elliptica*	white wintergreen
RIBEAME	s	*Ribes americanum*	wild black currant
RIBEOXY	s	*Ribes oxyacanthoides*	northern gooseberry
RIBETRI	s	*Ribes triste*	wild red currant
ROSAACI	s	*Rosa acicularis*	prickly rose
ROSAARK	s	*Rosa arkansana*	prairie rose
ROSAWOO	s	*Rosa woodsii*	common wild rose
RUBUIDA	s	*Rubus idaeus*	wild red raspberry
RUBUPUB	s	*Rubus pubescens*	dewberry
RUMECRI	f	*Rumex crispus*	curled dock
RUMEOCC	f	*Rumex occidentalis*	western dock
SALIBEB	s	*Salix bebbiana*	beaked willow
SALIDIS	s	*Salix discolor*	pussy willow
SALIEXI	s	*Salix exigua*	sandbar willow
SALISPP	s	*Salix* spp	willow species
SANIMAR	f	*Sanicula marilandica*	snakeroot
SCHIPUR	g	*Schizachne purpurascens*	purple oat grass
SCUTGAL	f	*Scutellaria galericulata*	marsh skullcap
SENECAN	f	*Senecio canus*	prairie groundsel
SENEERE	f	*Senecio eremophilus*	cut-leaved ragwort
SENEINT	f	*Senecio integerrimus*	entire-leaved groundsel
SENEVUL	f	*Senecio vulgaris*	common groundsel
SHEPCAN	s	*Shepherdia canadensis*	Canada buffaloberry
SMILSTE	f	*Smilacina stellata*	star-flowered Solomon's seal
SOLICAN	f	*Solidago canadensis*	Canada goldenrod
SOLIGIG	f	*Solidago gigantea*	late goldenrod
SOLIMIS	f	*Solidago missouriensis*	low goldenrod
SOLIRIG	f	*Solidago rigida*	stiff goldenrod
SOLISPA	f	*Solidago spathulata*	mountain goldenrod
SPIRALB	s	*Spiraea alba*	narrow-leaved meadowsweet
STACPAL	f	*Stachys palustris*	marsh hedge-nettle
STIPCOM	g	*Stipa comata*	needle-and-thread
STIPCUR	g	*Stipa curtiseta*	western porcupine grass
STIPVIR	g	*Stipa viridula*	green needle grass
SYMPALB	s	*Symphoricarpos albus*	snowberry
SYMPOCC	s	*Symphoricarpos occidentalis*	buckbrush
TANAVUL	f	*Tanacetum vulgare*	common tansy
TARAOFF	f	*Taraxacum officinale*	common dandelion
THALVEN	f	*Thalictrum venulosum*	veiny meadow rue
TRAGDUB	f	*Tragopogon dubius*	common goat's beard
TYPHLAT	f	*Typha latifolia*	common cattail
URTIDIO	f	*Urtica dioica*	common nettle
VACCVIT	s	*Vaccinium vitis-idaea*	bog cranberry
VIBUEDU	s	*Viburnum edule*	low-bush cranberry
VIBUOPU	s	*Viburnum opulus*	high-bush cranberry
VICIAME	f	*Vicia americana*	wild vetch

Species Code	Growth Form	Latin Name	Common Name
VIOLADU	f	*Viola adunca*	early blue violet
VIOLCAN	f	*Viola canadensis*	western Canada violet
VIOLREN	f	*Viola renifolia*	kidney-leaved violet

Appendix 4 - Mammals of Big Knife Provincial Park

(from the Alberta Watchable Wildlife Checklist compiled by Macdonald and McIsaac, 1993b)

Shrews (Order Insectivora)

Masked Shrew (*Sorex cinereus*)
Prairie Shrew (*Sorex haydeni*)
Dusky Shrew (*Sorex monticolus*)
Water Shrew (*Sorex palustris*)
Arctic Shrew (*Sorex arcticus*)

Bats (Order Chiroptera)

Little Brown Bat (*Myotis lucifugus*)
Silver-haired Bat (*Lasionycteris noctivagans*)
Big Brown Bat (*Eptesicus fuscus*)
Hoary Bat (*Lasiurus cinereus*)

Pika, Hares, and Rabbits (Order Lagomorpha)

Snowshoe Hare (*Lepus americanus*)
White-tailed Jack Rabbit (*Lepus townsendii*)

Rodents (Order Rodentia)

Least Chipmunk (*Tamias minimus*)
Richardson's Ground Squirrel (*Spermophilus richardsonii*)
Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*)
Franklin's Ground Squirrel (*Spermophilus franklinii*)
Red Squirrel (*Tamiasciurus hudsonicus*)
Northern Pocket Gopher (*Thomomys talpoides*)
Beaver (*Castor canadensis*)
Deer Mouse (*Peromyscus maniculatus*)
Southern Red-backed Vole (*Clethrionomys gapperi*)
Meadow Vole (*Microtus pennsylvanicus*)
Prairie Vole (*Microtus ochrogaster*)
Muskrat (*Ondatra zibethicus*)
Meadow Jumping Mouse (*Zapus hudsonius*)
Western Jumping Mouse (*Zapus princeps*)
Porcupine (*Erethizon dorsatum*)

Carnivores (Order Carnivora)

Coyote (*Canis latrans*)
Red Fox (*Vulpes vulpes*)
Black Bear (*Ursus americanus*)

Carnivores cont'd

Ermine (*Mustela erminea)*
Least Weasel (*Mustela nivalis*)
Long-tailed Weasel (*Mustela frenata*)
Mink (*Mustela vison*)
Badger (*Taxidea taxus*)
Striped Skunk (*Mephitis mephitis*)
Canada Lynx (*Felix lynx*)*

Ungulates (Order Artiodactyla)

Wapiti or Elk (*Cervus elaphus*)**
Mule Deer (*Odocoileus hemionus*)
White-tailed Deer (*Odocoileus virginianus*)
Moose (*Alces alces*)

* Correct species name from Wild Furbearer Management and Conservation in North America edited by Novak et al (1987)

** Ebel et al. (1973) report that a Park officer observed one female elk over wintering in the Park in 1972-73. Since that period no other reportings of elk have been made.

Appendix 5 - Birds of Big Knife Provincial Park

(from the Alberta Watchable Wildlife Checklist compiled by Macdonald and McIsaac, 1993a)

Loon, Grebes
- Common Loon
- Pied-billed Grebe
- Horned Grebe
- Red-necked Grebe
- Western Grebe

Pelicans, Herons, Allies
- American White Pelican
- Double-breasted Cormorant
- American Bittern
- Great Blue Heron
- Black-crowned Night Heron

Waterfowl
- Trundra Swan
- Greater White-fronted Goose
- Snow Goose
- Snow (Blue) Goose
- Ross' Goose
- Canada Goose
- Green-winged Teal
- Mallard
- Northern Pintail
- Blue-winged Teal
- Cinnamon Teal
- Northern Shoveler
- Gadwall
- American Wigeon
- Canvasback
- Redhead
- Ring-necked Duck
- Greater Scaup
- Lesser Scaup
- White-winged Scoter
- Common Goldeneye
- Barrow's Goldeneye
- Bufflehead
- Common Merganser
- Ruddy Duck

Hawks, Falcons, Allies
- Turkey Vulture
- Osprey
- Bald Eagle
- Northern Harrier
- Sharp-shinned Hawk

Hawks, Falcons, Allies cont'd
- Cooper's Hawk
- Northern Goshawk
- Broad-winged Hawk
- Swainson's Hawk
- Red-tailed Hawk
- Red-tailed (Harlan's) Hawk
- Ferruginous Hawk
- Rough-legged Hawk
- Golden Eagle
- American Kestrel
- Merlin

Pheasants, Grouse, Allies
- Gray Partridge
- Ring-necked Pheasant
- Ruffed Grouse
- Sharp-tailed Grouse
- Wild Turkey

Rails, Cranes
- Sora
- American Coot
- Sandhill Crane

Shorebirds
- Killdeer
- American Avocet
- Greater Yellowlegs
- Lesser Yellowlegs
- Solitary Sandpiper
- Willet
- Spotted Sandpiper
- Upland Sandpiper
- Marbled Godwit
- Semipalmated Sandpiper
- Least Sandpiper
- Baird's Sandpiper
- Pectoral Sandpiper
- Short-billed Dowitcher
- Long-billed Dowitcher
- Common Snipe
- Wilson's Pharalope

Gulls, Terns, Allies
- Franklin's Gull
- Bonaparte's Gull

Gulls, Terns, Allies cont'd
- Ring-billed Gull
- California Gull
- Herring Gull
- Common Tern
- Forster's Tern
- Black Tern

Doves, Cuckoos
- Rock Dove
- Mourning Dove
- Black-billed Cuckoo

Owls
- Great Horned Owl
- Snowy Owl
- Northern Pygmy-Owl
- Great Gray Owl
- Long-eared Owl
- Short-eared Owl
- Northern Saw-whet Owl

Nighthawks to Kingfishers
- Common Nighthawk
- Ruby-throated Hummingbird
- Belted Kingfisher

Woodpeckers
- Lewis's Woodpecker
- Yellow-bellied Sapsucker
- Red-naped Sapsucker
- Downy Woodpecker
- Hairy Woodpecker
- Three-toed Woodpecker
- Black-backed Woodpecker
- Northern (yellow-shafted) Flicker
- Pileated Woodpecker

Flycatchers
- Olive-sided Flycatcher
- Western Wood Peewee
- Alder Flycatcher
- Least Flycatcher
- Eastern Phoebe
- Say's Phoebe
- Eastern Kingbird

Larks, Swallows
- Horned Lark
- Tree Swallow
- Northern Rough-winged Swallow
- Bank Swallow
- Cliff Swallow
- Barn Swallow

Jay, Crows, Allies
- Blue Jay
- Black-billed Magpie
- American Crow
- Common Raven

Chickadees to Dippers
- Black-capped Chickadee
- Mountain Chickadee
- Boreal Chickadee
- Red-breasted Nuthatch
- White-breasted Nuthatch
- Brown Creeper
- House Wren
- Marsh Wren

Kinglets to Thrashers
- Golden-crowned Kinglet
- Ruby-crowned Kinglet
- Mountain Bluebird
- Veery
- Gray-cheeked Thrush
- Swainson's Thrush
- Hermit Thrush
- American Robin
- Gray Catbird
- Northern Mockingbird
- Brown Thrasher

Pipits to Starlings
- American Pipit
- Sprague's Pipit
- Bohemian Waxwing
- Cedar Waxwing
- Northern Shrike
- Loggerhead Shrike
- European Starling

Vireos, Warblers
- Solitary Vireo
- Warbling Vireo
- Philadelphia Vireo
- Red-eyed Vireo
- Tennessee Warbler
- Orange-crowned Warbler
- Yellow Warbler
- Magnolia Warbler
- Cape May Warbler
- Yellow-rumped (Myrtle) Warbler
- Black-throated Green Warbler
- Palm Warbler
- Bay-breasted Warbler
- Blackpoll Warbler

Vireos, Warblers cont'd

- Black-and-White Warbler
- American Redstart
- Ovenbird
- Northern Waterthrush
- Connecticut Warbler
- Mourning Warbler
- Common Yellowthroat
- Wilson's Warbler

Tanagers, Cardinals, Allies

- Western Tanager
- Rose-breasted Grosbeak

Sparrows, Allies

- Rufous-sided Towhee
- Amercian Tree Sparrow
- Chipping Sparrow
- Clay-colored Sparrow
- Vesper Sparrow
- Lark Sparrow
- Savannah Sparrow
- Le Conte's Sparrow
- Sharp-tailed Sparrow
- Fox Sparrow
- Song Sparrow
- Lincoln's Sparrow
- Swamp Sparrow
- White-throated Sparrow
- White-crowned Sparrow
- Harris' Sparrow
- Dark-eyed (Slate-colored) Junco
- Dark-eyed (Oregon) Junco
- Lapland Longspur
- Smith's Longspur
- Chestnut-collared Longspur
- Snow Bunting

Blackbirds, Allies

- Bobolink
- Red-winged Blackbird
- Western Meadowlark
- Yellow-headed Blackbird
- Rusty Blackbird
- Brewer's Blackbird
- Common Grackle
- Brown-headed Cowbird
- Northern (Baltimore) Oriole

Finches, Allies

- Pine Grosbeak
- Purple Finch
- Red Crossbill
- White-winged Crossbill
- Common Redpoll
- Hoary Redpoll
- Pine Siskin
- American Goldfinch
- Evening Grosbeak
- House Sparrow

Appendix 6 - Amphibians and Reptiles of Big Knife Provincial Park

(from the Alberta Watchable Wildlife Checklist compiled by Macdonald and McIsaac, 1993b)

Amphibians

Salamanders

Tiger salamander (*Ambystoma tigrinum*)

Toads

Canadian toad (*Bufo hemiophrys*)

Frogs

Boreal Chorus Frog (*Pseudacris triseriata maculata*)
Wood Frog (*Rana sylvatica*)
Northern Leopard Frog (*Rana pipens*)

Reptiles

Snakes

Western Plains Garter Snake (*Thamnophis radix haydeni*)

SOURCE: Petry, 1998; Macdonald, C and P. MacIsacc, 1993.

Appendix 7 - Fish of Big Knife Provincial Park

(from the Alberta Watchable Wildlife Checklist compiled by Macdonald and McIsaac, 1993b)

Minnows, Suckers

Lake Chub (*Couesius plumbeus*)
Pearl Dace (*Margariscus margarita*)
Emerald Shiner (*Notropis atherinoides*)
Spottail Shiner (*Notropis hudsonius*)
Fathead Minnow (*Pimephales promelas*)
Longnose Dace (*Rhinichthys cataractae*)
Longnose Sucker (*Catostomus catostomus*)
White Sucker (*Catostomus commersoni*)

Pikes, Trouts

Northern Pike (*Esox lucius*)
Rainbow Trout (*Oncorhynchus mykiss*)

Trout-Perches, Codfishes, Sticklebacks

Trout-perch (*Percopsis omiscomaycus*)
Burbot (*Lota lota*)
Brook Stickleback (*Culaea inconstans*)

Sculpins

Spoonhead Sculpin (*Cottus ricei*)

Perches

Iowa Darter (*Etheostoma exile*)
Yellow Perch (*Perca flavescens*)
Walleye (*Stizostedion vitreum*)

BIG KNIFE PROVINCIAL PARK NATURAL HISTORY THEME CLASSIFICATION (describes classification on Maps 2 and 3)

LEVEL 1 - Landforms and Surficial Materials					LEVEL 2		LEVEL 3	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**	**Broad Vegetation Class and Associated Soil Great Groups**		**Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season**	
NON SANDY UPLAND	Ground Moraine	**Ng1** Level to undulating medium textured morainal upland with occasional coarse textured glaciofluvial veneers over till.	0 to 5%	Well drained	Grasslands - **G**	Grasslands (Black Chernozems)	**Plains Rough Fescue - Kentucky Blue Grass** (Orthic Black Chernozems	15, 23A, 59
					Shrublands	Low Shrublands - **LS** (Black Chernozems)	**Buckbrush** (Orthic Black Chernozems	23C
							Buckbrush - Wild Red Raspberry - Rose (Orthic Black Chernozems)	64
						Tall Shrublands - **TS** (Black Chernozems)	**Silverberry** (Orthic Black Chernozems)	23B
					Woodlands	Deciduous Woodlands - **DW**		
		Ng2 Remnant morainal upland that slumped to a lower level many years ago; surface deposits are thin medium textured till veneers and blankets over bedrock with occasional bedrock at the surface.	2 to 25%	Well to moderately well drained	Grasslands - **G**	Grasslands (Solodized Solonetz's)	**Plains Rough Fescue - Kentucky Blue Grass** (Black Solodized Solonetz's)	47
					Shrublands	Low Shrublands - **LS**		
						Tall Shrublands - **TS**		
					Woodlands	Deciduous Woodlands - **DW** (Black Chernozems)	**Aspen - Balsam Poplar (White Spruce - Black Spruce) / Beaked Hazelnut** (Solonetzic Black Chernozems)	48
SANDY UPLAND	Sandy Plain	**Ss1** Level to undulating coarse textured glaciofluvial veneers over till with occasional medium textured till at the surface.	0 to 7%	Rapidly to well drained	Grasslands - **G**	Grasslands		
					Shrublands	Low Shrublands - **LS** (Black Chernozems)	**Buckbrush** (Orthic Black Chernozems)	63
						Tall Shrublands - **TS** (Black Chernozems)	**Silverberry** (Orthic Black Chernozems)	16
					Woodlands	Deciduous Woodlands - **DW** (Black Chernozems)	**Aspen / Choke Cherry / Saskatoon** (Orthic Black Chernozems)	8

LEVEL 1 - Landforms and Surficial Materials					LEVEL 2 Broad Vegetation Class and Associated Soil Great Groups		LEVEL 3 Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**				
SANDY UPLAND (cont'd)	Sandy Plain (cont'd)	**Ss1** (cont'd)	0 to 7% (cont'd)	Rapidly to well drained (cont'd)	Woodlands (cont'd)	Deciduous Woodlands **DW** (cont'd)	**Aspen / Buckbrush - Wild Red Raspberry - Rose** (Orthic Black Chernozems)	17, 18, 19, 62
VALLEY/ RIDGE	Protected Slope	**Vp1** Inclined valley slopes (primarily north-facing) overlain by medium textured till and occasionally by coarse textured glaciofluvial veneers over till. Slopes reveal evidence of old rotational slumps now stabilized by predominantly Woodland and Tall Shrubland vegetation.	10 to 60%	Rapidly to moderately well drained	Grasslands - **G**	Grasslands		
					Shrublands	Low Shrublands - **LS**		
						Tall Shrublands - **TS** (Eutric Brunisols)	**Chokecherry - Saskatoon** (Orthic Eutric Brunisols)	56
					Woodlands	Deciduous Woodlands - **DW** (Eutric Brunisols)	**Aspen - Balsam Poplar (White Spruce - Black Spruce) / Beaked Hazelnut** (Orthic Eutric Brunisols)	9, 10, 35, 44
						Mixed Woodlands - **MW** (Regosols and Eutric Brunisols)	**White Spruce - Aspen (Balsam Poplar) / Rose** (Cumulic Regosols and Orthic Eutric Brunisols)	11, 43
						Coniferous Woodland - **CW**		
		Vp2 Inclined valley slopes (primarily south facing) overlain by medium textured till and occasionally by coarse textured glaciofluvial veneers over till.	25 to 70%	Very rapidly to rapidly drained	Grasslands - **G**	Grasslands (Regosols and Eutric Brunisols)	**Sand Grass / Muhly Grass** (Orthic Regosols and Orthic Eutric Brunisols)	21, 22
					Shrublands	Low Shrublands - **LS** (Dark Brown Chernozems)	**Buckbrush** (Orthic Dark Brown Chernozems)	58
						Tall Shrublands - **TS**		
					Woodlands	Deciduous Woodlands - **DW**		
		Vp3 Vegetated coarse to fine textured fluvial aprons at the base of protected slopes overlain by till (Vp1, Vp2) and steep bedrock outcrops (Vx).	2 to 20%	Well to moderately well drained	Grasslands – **G**	Grasslands (Solodized Solonetz's, Solonetz's and Regosols)	**Plains Rough Fescue - Kentucky Blue Grass** (Black Solonetz's and Black Solodized Solonetz's)	12, 53, 57, 67

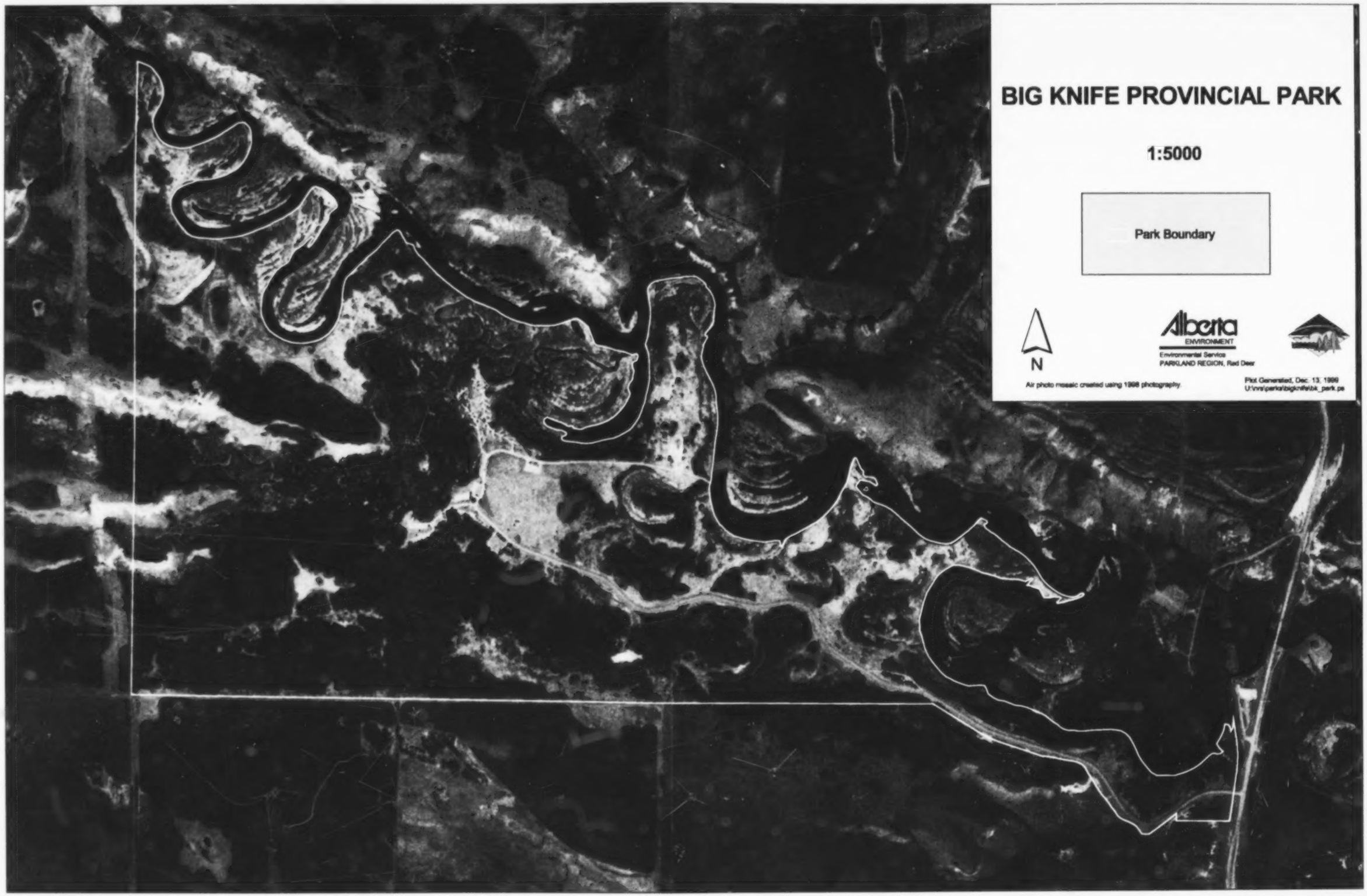
LEVEL 1 - Landforms and Surficial Materials					LEVEL 2		LEVEL 3	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**	**Broad Vegetation Class and Associated Soil Great Groups**		**Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season**	
VALLEY/ RIDGE (cont'd)	Protected Slope (cont'd)	**Vp3** (cont'd)	2 to 20% (cont'd)	Well to moderately well drained (cont'd)	Grasslands – **G** (cont'd)	Grasslands (Solodized Solonetz's, Solonetz's and Regosols (cont'd)	**Kentucky Blue Grass - Western Wheat Grass** (Black Solodized Solonetz's and Orthic Regosols - saline phase)	49, 69
					Shrublands	Low Shrublands - **LS**		
					Shrublands (cont'd)	Tall Shrublands - **TS**		
						Wet Tall Shrublands - **TSW** (Regosols)	**(White Spruce) / Willow - River Alder - Red-osier Dogwood** (Cumulic Regosols)	20
					Woodlands	Deciduous Woodlands - **DW** (Regosols)	**Aspen / Choke Cherry - Saskatoon** (Cumulic Regosols)	34
						Mixed Woodlands - **MW** (Regosols and Black Chernozems)	**Aspen - Balsam Poplar / Red-osier Dogwood** (Cumulic Regosols and Solonetzic Black Chernozems)	50, 70
						Coniferous Woodlands - **CW** (Solodized Solonetz's)	**White Spruce / Rose** (Black Solodized Solonetz's)	13
		Vp4 Incised, V-shaped valley containing an intermittent stream channel flowing north into the Battle River; valley slopes are vegetated.	45 to 75%	Well to rapdily drained	Shrublands	Low Shrublands - **LS**		
	Springs	**Vs** Spring on north-facing slopes; unit includes discharge zone below the spring source; parent materials are medium textured till deposits.	10 to 20%	Very poorly drained	Wet Meadows - **WM**	Wet Meadows (Spring) (Gleysols)	**Water Sedge - Awned Sedge** (Rego Gleysols)	46
	Exposed Slope	**Vx** Steep, eroded Late Cretaceous (Horseshoe Canyon & Bearpaw formations) bedrock outcrops and occasional colluvial veneers over bedrock on upper slopes.	65 to >100%	Very rapidly drained	Non-vegetated - **NV**	Non-vegetated		
					Shrublands	Low Shrublands - **LS**		
						Tall Shrublands - **TS**		

LEVEL 1 - Landforms and Surficial Materials					LEVEL 2		LEVEL 3	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**	**Broad Vegetation Class and Associated Soil Great Groups**		**Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season**	
VALLEY/ RIDGE (cont'd)	Exposed Slope (cont'd)	**Vx** (cont'd)	65 to >100% (cont'd)	Very rapidly drained (cont'd)	Woodlands	Deciduous Woodlands - **DW**		
	Floor / Stream	**Vf1** Big Knife Creek channel and its tributaries; extensive ponding and restriction of flow due to beaver dams; recent fluvial deposits in the channels are coarse textured.	0 to 5%	Very poorly to imperfectly drained With occasional well to rapidly drained sites	Woodlands	Coniferous Woodlands - **CW** (Eutric Brunisols)	**White Spruce - Rose** (Orthic Eutric Brunisols)	40
					Open Water - **OW**	Open Water		
		Vf2 Floodplain of Big Knife Creek and its tributaries overlain by medium to coarse textured fluvial deposits	2 to 5%	Well to rapidly drained with occasional very poorly drained conditions	Shrublands	Wet Tall Shrublands - **TSW** (Gleysols)	**(White Spruce) / Willow / River Alder - Red-osier Dogwood** (Orthic Humic Gleysols)	14
					Woodlands	Deciduous Woodlands - **DW**		
						Mixed Woodlands - **MW**		
						Coniferous Woodlands - **CW** (Eutric Brunisols and Regosols)	**White Spruce / Rose** (Orthic Eutric Brunisols and Orthic Regosols)	41, 42
		Vf3 Battle River fluvial terrace with shallow remnant channels eroded into the terrace surface; terraces overlain primarily with medium textured fluvial deposits.	0 to 10%	Well to mcderately well drained	Grasslands - **G**	Grasslands (Orthic Black Chernozems)	**Plains Rough Fescue - Kentucky Blue Grass** (Orthic Black Chernozems)	68
					Shrublands	Low Shrublands - **LS** (Black Chernozems and Eutric Brunisols)	**Buckbrush** (Orthic Black Chernozems and Orthic Eutric Brunisols)	6, 25, 29, 30, 33, 37, 66
							Buckbrush - Wild Red Raspberry - Rose (Orthic Black Chernozems)	1, 54
						Tall Shrublands - **TS** (Black Chernozems and Eutric Brunisols)	**Silverberry / Buckbrush** (Orthic Black Chernozems)	36

LEVEL 1 - Landforms and Surficial Materials					LEVEL 2		LEVEL 3	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**	**Broad Vegetation Class and Associated Soil Great Groups**		**Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season**	
VALLEY/ RIDGE (cont'd)	Floor / Stream (cont'd)	**Vf3** (cont'd)	0 to 10% (cont'd)	Well to moderately well drained (cont'd)	Shrublands (cont'd)	Tall Shrublands – **TS** (Black Chernozems and Eutric Brunisols) (cont'd)	**Choke Cherry / Saskatoon** (Orthic Eutric Brunisols)	39
					Woodlands	Deciduous Woodlands - **DW** (Black Chernozems)	**Aspen / Buckbrush - Wild Red Raspberry - Rose** (Orthic Black Chernozems)	2
							Aspen / Choke Cherry - Saskatoon (Orthic Black Chernozmems)	27
						Coniferous Woodlands - **CW**		
		Vf4 Fluvial terraces overlain by varying layers of medium to fine textured fluvial apron deposits (mainly saline) located west of Big Knife Creek confluence.	0 to 5%	Well to moderately well drained	Grasslands - **G**	Grasslands (Solodized Solonetz's, and Regosols)	**Plains Rough Fescue - Kentucky Blue Grass** (Orthic Regosols - saline phase)	60
							Kentucky Blue Grass - Western Wheat Grass (Black Solodized Solonetz's and Orthic Regosols - saline phase	31, 38, 61
					Shrublands	Low Shrublands - **LS**		
						Tall Shrublands - **TS**		
					Woodlands	Deciduous Woodlands - **DW**		
		Vf5 Battle River floodplain; intermediate in elevation between Vf3 fluvial terraces (higher) and Wd and WdVf5 wetlands (lower); medium to coarse textured fluvial deposits overlie this floodplain.	0 to 6%	Poorly to imperfectly drained	Shrublands	Low Shrublands - **LS**		
						Tall Shrublands - **TS**		
						Wet Tall Shrublands - **TSW** (Gleysols)	**(White Spruce) / Willow - River Alder - Red-osier Dogwood** (Rego Gleysols and Orthic Gleysols)	4, 24, 51
					Woodlands	Deciduous Woodlands - **DW**		

LEVEL 1 - Landforms and Surficial Materials					LEVEL 2		LEVEL 3	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**	**Broad Vegetation Class and Associated Soil Great Groups**		**Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season**	
VALLEY/ RIDGE (cont'd)	Floor / Stream (cont'd)	**Vf5** (cont'd)	0 to 6% (cont'd)	Poorly to imperfectly drained (cont'd)	Wet Meadows - **WM**	Wet Meadows		
					Open Water - **OW**	Open Water		
		Vf6 Local medium to fine textured lacustrine deposits in remnant Battle River fluvial channels located west of the Big Knife Creek confluence.	0 to 2%	Poorly to very poorly drained	Marsh	Shallow Marsh - **SM** (Gleysols)	**Awned Sedge** (Rego Gleysols)	28
							Awned Sedge - Common Tall Manna Grass (Rego Gleysols)	32
		Vf7 Local lacustrine deposits in remnant fluvial channels located east of the Big Knife Creek confluence; these deposits have a higher salinity than Vf6 sediments.	0 to 2% with occasional slopes as high as 15%	Poorly drained to imperfectly drained	Grassland - **G**	Grasslands		
					Shrublands	Low Shrublands - **LS**		
					Woodlands	Deciduous Woodlands - **DW** (Black Chernozems and Black Solods)	**Apsen / Buckbrush - Wild Red Raspberry - Rose (hygric site)** (Gleyed Black Chernozems and Gleyed Black Solods)	7, 55
					Wet Meadows - **WM**	Wet Grass Meadows (Black Solods)	**Redtop - Slough Grass - Foxtail Barley - Marsh Reed Grass** (Gleyed Black Solods)	52
					Marsh	Shallow Marsh - **SM** (Gleysols)	**Awned Sedge** (Rego Gleysols)	65
		Wd Emergent aquatic vegetation in low lying submerged areas along the Battle River; underlying fluvial floodplain deposits are medium to coarse textured.	0%	Very poorly drained	Marsh	Deep Marsh - **DM**	**Common Cattail** (Rego Gleysols)	26
		WlWm Pond and Wet Meadow at the base of an active spring in the eastern part of the Park; underlying lacustrine sediments are fine textured	0%	Very poorly drained	Wet Meadow - **WM**	Wet Meadow		
					Open Water - **OW**	Open Water		

LEVEL 1 - Landforms and Surficial Materials					LEVEL 2		LEVEL 3	Associated Field Sample Sites
Type	**Theme**	**Landscape Types**	**Slope**	**Drainage Class**	**Broad Vegetation Class and Associated Soil Great Groups**		**Vegetation Communities (in bold) and Soil Subgroups observed during 1998 Summer Field Season**	
VALLEY / RIDGE (cont'd)	Floor / Stream (cont'd)	**WdVf5** Lower level of the Battle River consisting of well developed point bars and swales; most of the unit submerged under water with occasional slightly higher areas overlain with medium to coarse textured fluvial deposits.	0 to 5%	Poorly to very poorly drained	Shrublands	Tall Wet Shrublands - **TSW**		
					Wet Meadow - **WM**	Wet Meadow (Gleysols)	**Redtop - Slough Grass - Foxtail Barley - Marsh Reed Grass** (Rego Gleysols)	5
					Marsh	Deep Marsh - **DM**		
DISTURBANCE		**D1** Old gravel excavation in coarse glaciofluvial veneer over till	2 to 5%	Moderately well drained	Shrublands	Tall Shrubland - **TS** (Black Chernozems)	**Silverberry / Buckbrush** (Orthic Black Chernozems)	45
		D2 Park road, parking lots, areas around Park buildings and campgrounds; this Level 1 subgroup crosses over areas of medium textured (Vf3) and coarse to fine textured fluvial aprons (Vp3)	0 to 2% on average with slopes as high as 40% in steep ditches along entrance road into the Park.	Imperfectly to well drained.	Anthropogenic - **A**	Anthropogenic		
		D3 Old excavation and refuse pit on a medium textured fluvial terrace near the Battle River.	1 to 15%	Well to rapidly drained.	Shrublands	Low Shrublands - **LS**		
		D4 Sports field in a former cultivated field currently vegetated with dense smooth brome; underlying medium textured fluvial terrace deposits have been disturbed by past cultivation.	0 to 2%	Moderately well to imperfectly drained.	Grasslands - **G**	Grasslands (Black Chernozems)	**Smooth Brome** (Orthic Black Chernozems to Gleyed Black Chernozems)	3



BIG KNIFE PROVINCIAL PARK

1:5000

Park Boundary

N

Alberta
ENVIRONMENT
Environmental Service
PARKLAND REGION, Red Deer

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Plot Generated, Dec. 13, 1999
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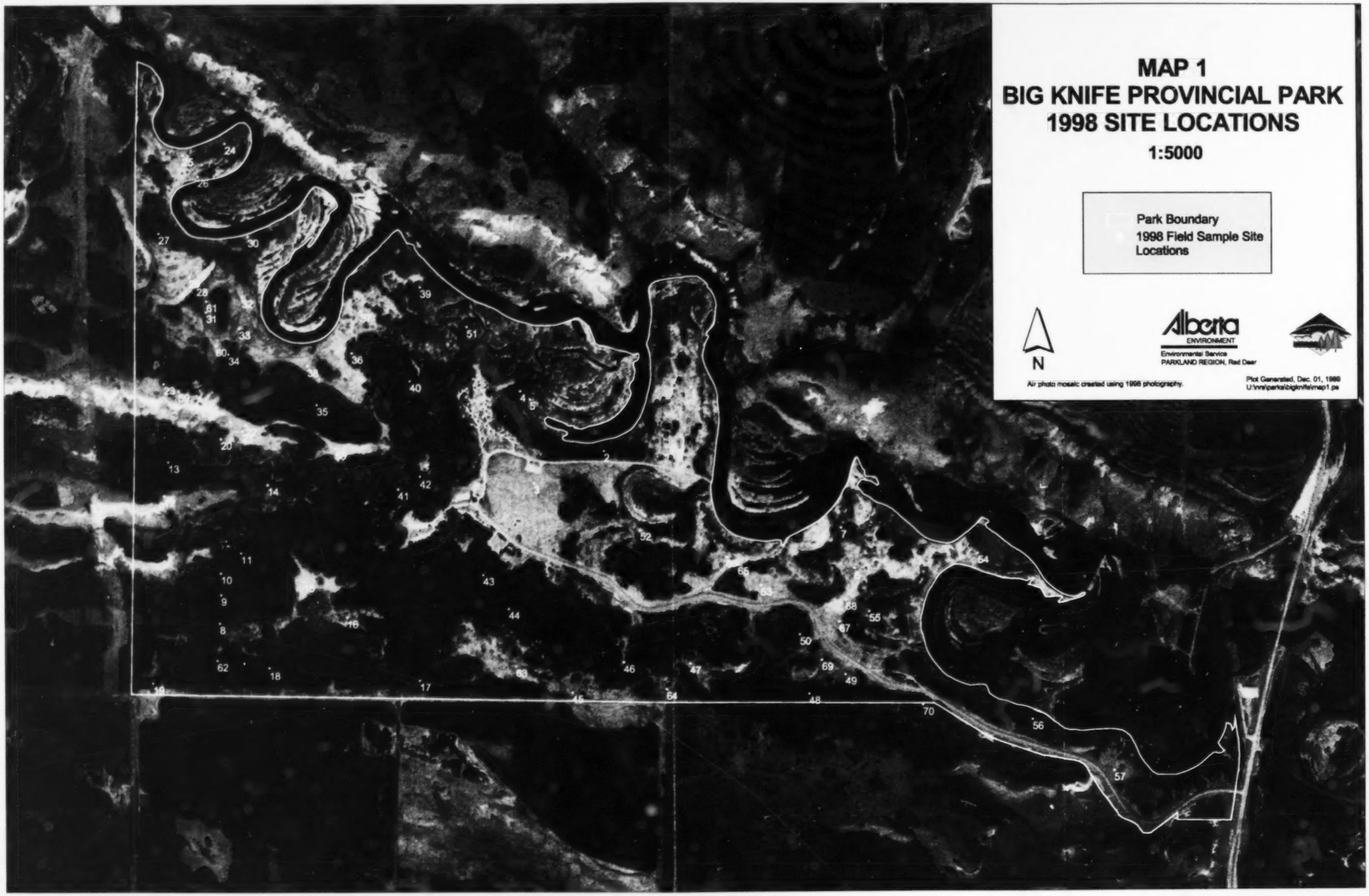

MAP 1
BIG KNIFE PROVINCIAL PARK
1998 SITE LOCATIONS

1:5000

Park Boundary
1998 Field Sample Site Locations

N

Alberta
ENVIRONMENT
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PARKLAND REGION, Red Deer

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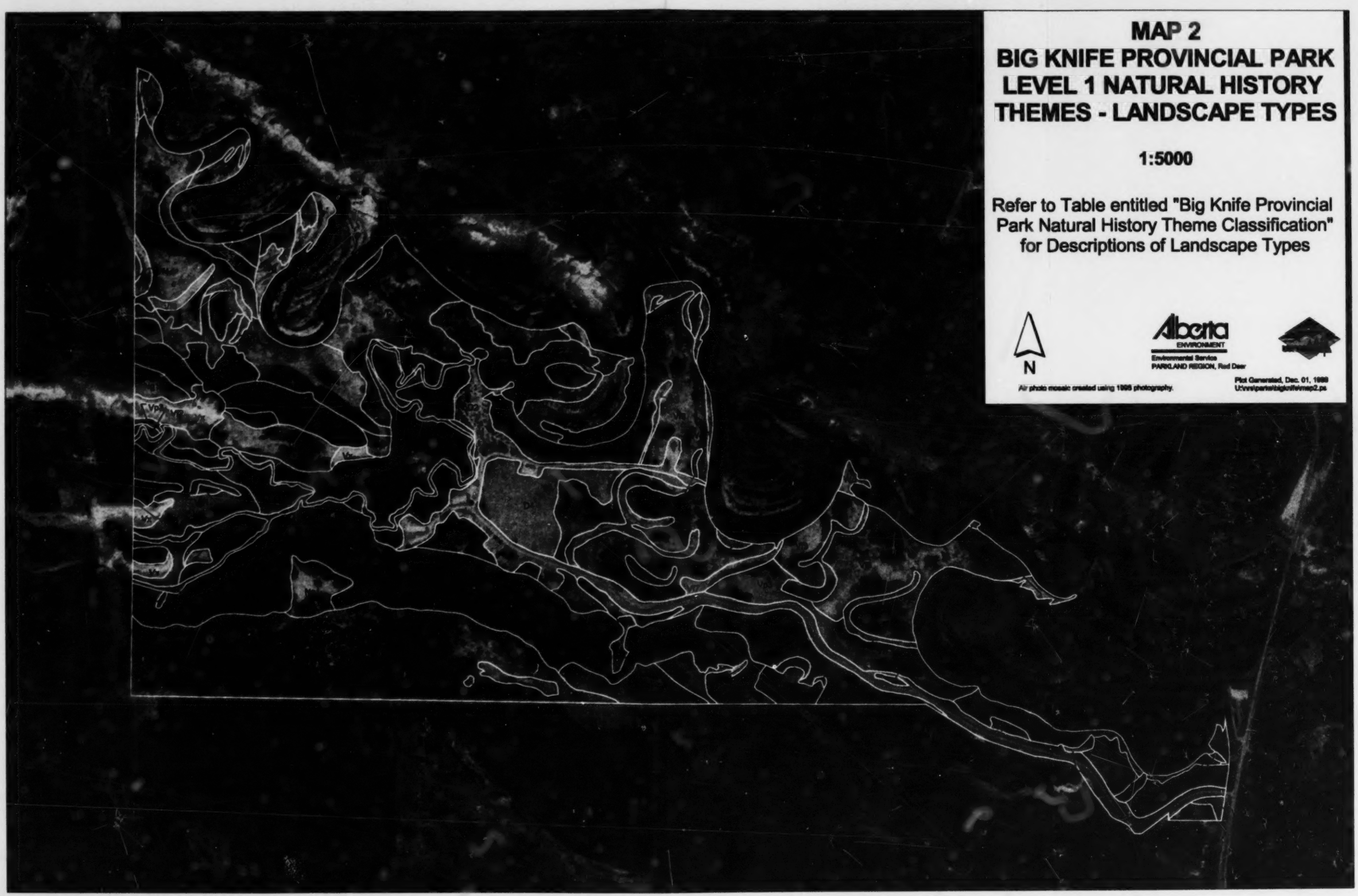

MAP 2
BIG KNIFE PROVINCIAL PARK
LEVEL 1 NATURAL HISTORY THEMES - LANDSCAPE TYPES

1:5000

Refer to Table entitled "Big Knife Provincial Park Natural History Theme Classification" for Descriptions of Landscape Types

N

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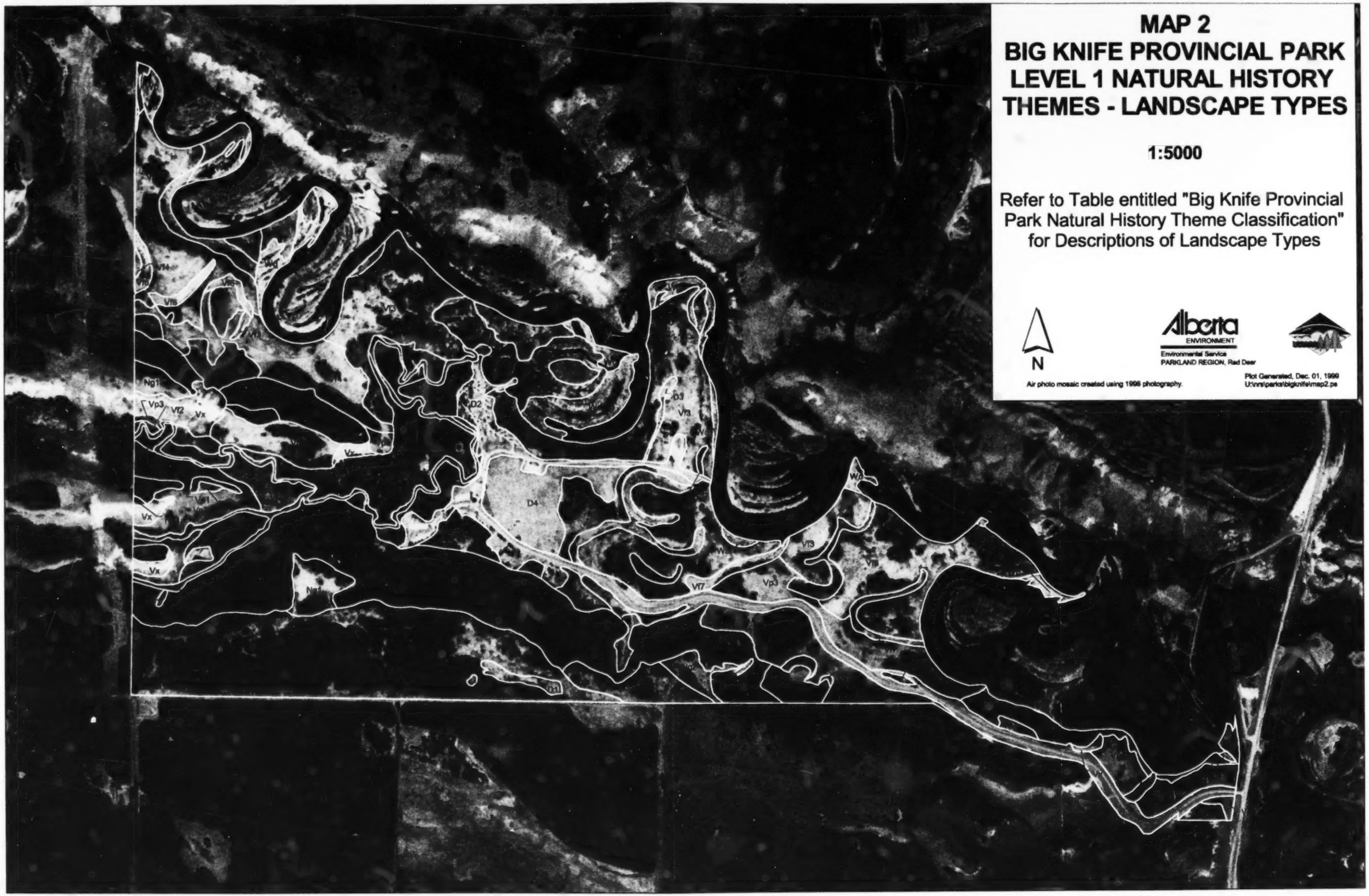

MAP 2
BIG KNIFE PROVINCIAL PARK
LEVEL 1 NATURAL HISTORY THEMES - LANDSCAPE TYPES

1:5000

Refer to Table entitled "Big Knife Provincial Park Natural History Theme Classification" for Descriptions of Landscape Types

N

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MAP 3
BIG KNIFE PROVINCIAL PARK
LEVEL 2 NATURAL HISTORY THEMES - VEGETATION TYPES

1:5000

Legend:

A Anthropogenic	NV Non Vegetated
CW Coniferous Woodland	OW Open Water
DM Deep Marsh	SM Shallow Marsh
DW Deciduous Woodland	TS Tall Shrubland
G Grassland	TSW Tall Wet Shrubland
LS Low Shrubland	WM Wet Meadow
MW Mixed Woodland	

Definition of Proportional Symbols:

LS7G3
70% covered by Low Shrubland
30% covered by Grassland

LS10
100% covered by Low Shrubland

N

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ENVIRONMENT
Environmental Service
PARKLAND REGION, Red Deer

Air photo mosaic created using 1998 photography.

Plot Generated, Dec. 8, 1999
U:\nrs\parks\bigknife\map3.ps

This map has been reduced from the original (36 x 48). The scale as indicated by the representative fraction (1:5000), is no longer valid.

MAP 3
BIG KNIFE PROVINCIAL PARK
LEVEL 2 NATURAL HISTORY
THEMES - VEGETATION TYPES

1:5000

Legend:

A	Anthropogenic	NV	Non Vegetated
CW	Coniferous Woodland	OW	Open Water
DM	Deep Marsh	SM	Shallow Marsh
DW	Deciduous Woodland	TS	Tall Shrubland
G	Grassland	TSW	Tall Wet Shrubland
LS	Low Shrubland	WM	Wet Meadow
MW	Mixed Woodland		

Definition of Proportional Symbols:

LS7G3
70% covered by Low Shrubland
30% covered by Grassland

LS10
100% covered by Low Shrubland

N

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MAP 4
BIG KNIFE PROVINCIAL PARK
SIGNIFICANT FEATURES

1:5000

Park Boundary

1998 field site with a plains rough fescue (*Festuca hallii*)component; often located in open grasslands or as an understory grass species in low and tall shrublands (*Festuca hallii* alliance -Alberta Natural Heritage Information Centre Preliminary Plant Community Tracking List, May 1999)

Exposures of Upper Cretaceous Horseshoe Canyon and Belly River sedimentary bedrock creating local badlands features

Spring source (Greenlee, 1983).

Mature white spruce (*Picea glauca*)forest on the Big Knife Creek floodplain and the lower north-facing Battle River valley slopes.

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